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AMMRC AUTOMATED STRESS-STRAIN DATA ANALYSIS, STORAGE, AND RETRI--ETC(U)
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**AMMRC AUTOMATED STRESS-STRAIN DATA ANALYSIS,
STORAGE, AND RETRIEVAL -
PART 3: COMPUTER PROGRAM LISTINGS**

April 1979

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ABSTRACT

✓ FORTRAN program listings are given for all the computer programs used in the reduction, analysis, storage, and retrieval of experimental stress-strain data. The program files which are listed are R*PICPTS for data reduction, R*EVALRO for data analysis, R*RETRIEVE for retrieval of computer-stored data, and R*FIXBANK for data entry into the computer memory. Description of the procedures for using the programs are given in AMMRC TR 79-16 and AMMRC TR 79-17.

One objective of the developed computer procedures was to make in-house data readily available and hence more useful to the Engineering Standardization Division in their continuous efforts to improve standards and tolerances for material. ✓

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INTRODUCTION

A system of computer-assisted stress-strain data reduction analysis, storage, and retrieval was described in the two previous parts of this three-part series of reports.^{1,2} In this report, the FORTRAN listings of the computer programs are presented.

FORTRAN symbolic routines and subroutines of four files catalogued in the UNIVAC 1106 machine are listed. The file names and functions are as follows:

R*PICPTS for raw data reduction

R*EVALRO for data analysis

R*RETRIEVE for accessing the data stored in the DATABANK file

R*FIXBANK for updating the LOCATER and DATABANK files.

Two data files, R*LOCATER and R*DATABANK, are not listed.

Two of the files, R*PICPTS and R*RETRIEVE, use graphics subroutines which are part of the TEKTRONIX PLOT-10 package. These subroutines are not listed and neither are a group of subroutines in a BUFFPK package which interfaces the PLOT-10 subroutines with the particular UNIVAC 1106 executive system we use.

Both the PICPTS and the RETRIEVE programs are interactive, requiring entries by the user in response to instructions appearing at the terminal. Provisions have been included in both programs to detect a number of different types of input data errors and to allow the user to make immediate corrections at the terminal.

One objective of the developed computer procedures was to make in-house data readily available and hence more useful to the Engineering Standardization Division in their continuous efforts to improve standards and tolerances for material.

1. PAPIRNO, R. P. *AMMRC Automated Stress-Strain Data Analysis, Storage, and Retrieval - Part 1: Data Analysis Program*. Army Materials and Mechanics Research Center, AMMRC TR 79-16, April 1979.
2. PAPIRNO, R. P. *AMMRC Automated Stress-Strain Data Analysis, Storage, and Retrieval - Part 2: Data Entry and Retrieval Procedures*. Army Materials and Mechanics Research Center, AMMRC TR 79-17, April 1979.

LISTING OF R*PICPTS

The PICPTS file consists of the following symbolic elements:

Element	Function
MAIN	Main program for reducing raw stress-strain data
PICK	Subroutine for digitizing a curve using the TEKTRONIX 4662 interactive plotter
BUFFPK	Subroutine package for interfacing the TEKTRONIX PLOT-10 package to the UNIVAC 1106
START	Control routine to prepare for punching output and to start execution of program
STOP	Control routine to punch output at a remote UNIVAC 9300 terminal
PRINT	Control routine to punch PICPTS output, execute main program of EVALRO and print EVALRO output. Punch and print operations at a remote UNIVAC 9300 terminal.
MAP1	Control routine used to PREP the file, form the absolute (name: PICKEM), PACK the file, and print a list of file elements.

TEKTRONIX PLOT-10 subroutines which are called but for which no listings are given are as follows:

1. In the element MAIN: INITT, TERM, CHRSIZ, ANMODE, TOUTST, MOVABS, TSEND, BELL, NEWPAG, DCURSR, and FINITT.
2. In the element PICK: TINSTR.

The PLOT-10 subroutines are referenced from the file DAO*TEX and from the BUFFPK package when the absolute program is created.

PICPTS is executed from a TEKTRONIX 4014 graphics terminal coupled to a TEKTRONIX 4662 Interactive Plotter. User instructions and a comprehensive description of the program output are given in Reference 3.

Listings of MAIN are given on pages 3-8 and PICK on page 9. The four control routines are listed, in the order given above, on page 9.

3. PAPIRNO, R. P. *PICPTS Computer Program for Digitizing Testing Machine Autographic Records: User Instructions*. Army Materials and Mechanics Research Center, AMMRC TN 78-6, June 1978.


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1 C-----
2 C * THIS IS THE MAIN PROGRAM OF THE FILE PICPTS (ABSOLUTE: PICKEM)
3 C-----
4 C
5 C * FILE ALSO INCLUDES SUBROUTINE PICK * GRAPHIC SUBROUTINES NOT LISTED
6 C * GRAPHICS SUBROUTINES FROM TEKTRONIX PLOT 10 PACKAGE
7 C
8 C * INTERACTIVE PROGRAM FOR DATA REDUCTION OF STRESS-STRAIN TEST RESULTS
9 C * EXECUTED ON A TEKTRONIX 4014 COUPLED TO A TEKTRONIX 4662 DIGITAL PLOTTER
10 C
11 C-----
12 C
13     DIMENSION IPLTON(3),IPLTOF(3),S(99),E(99),ICHGE(99),
14     1SS(20),EE(20),II(20),IICHGE(20)
15     DATA IPLTON/27,65,69/
16     DATA IPLTOF/27,65,70/
17     CALL INITT(30)
18     CALL TERM(2,1024)
19     CALL CHRSTZ(3)
20 C
21 C-----
22 C
23 C * * * READ-IN OF IDENTIFYING DATA * * *
24 C
25     CALL ANMODE
26     NRUN=0
27     NPRINT=1
28 C
29 C-----
30 C
31 1     PRINT 200
32     MX=1
33     READ(5,100,ERR=5),SNO
34 2     PRINT 201
35     MX=2
36     READ(5,101,ERR=5),PPL,PULT,AREA,ELONG,RA,RCH,ISET
37     PRINT 202
38     READ 102,ANS
39     IF(ANS.EQ.'YES') GO TO 10
40 3     PRINT 203
41     MX=3
42     READ(5,103,ERR=5),WMTL,XMTL,YMTL,ZMTL,KTEMP,KEDOT
43 4     PRINT 204
44     MX=4
45     READ(5,104,ERR=5),BOCK,NPAGE,NDATE,TYPE
46     GO TO 10
47 C
48 C-----
49 C
50 C * * * * * INPUT ERROR CORRECTION ROUTINE * * * * *
51 C
52 5     PRINT 400
53     READ 102,ANS
54     IF(ANS.EQ.'YES') GO TO (1,2,3,4,11,32,33,37),MX
55     GO TO 60
56 C
57 C-----
58 C
59 C * * * * * CALIBRATION OF X-Y PLOTTER * * * * *
60 C * * IF PREVIOUS CALIBRATION IS VALID THIS ROUTINE IS OMITTED *
61 C
62 10    PRINT 205
63     READ 102,ANS
64     IF(ANS.EQ.'YES') GO TO 15
65 11    PRINT 206
66     MX=5
67     READ(5,101,ERR=5),CALS,CALE
68     XSTOP=CALE/10.

```

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69      YSTOP=CALS
70      PRINT 207
71      KOUNT=0
72      13  KOUNT=KOUNT+1
73          CALL BELL
74          IF(KOUNT.LE.3) GO TO 13
75          CALL TOUTST(3,IPLTON)
76          CALL MOVABS(50,50)
77          CALL TSEND
78          CALL PICK(IE,IS)
79          ICALOE=IE
80          ICALOS=IS
81          LOE=IE/4
82          LOS=IS/4
83          CALL MOVABS(LOE,LOS)
84          CALL TSEND
85          CALL PICK(IE,IS)
86          EUNIT=CALE/(IE-ICALOE)
87          SUNIT=CALS/(IS-ICALOS)
88          CALL TOUTST(3,IPLTOF)
89          KOUNT=0
90      14  KOUNT=KOUNT+1
91          CALL BELL
92          IF(KOUNT.LE.3) GO TO 14
93      C
94      C-----
95      C
96      C * * * * * DIGITIZING ROUTINE * * * * *
97      C * * * * * TWO STEP PROCESS FOR EACH POINT * * * * *
98      C * * STEP 1 DIGITIZE CURVE ZERO * * STEP 2 DIGITIZE CURVE POINT *
99      C
100     15  CALL NEWPAG
101         CALL DCURSR(IC,IXD,IYD)
102         CALL ANMODE
103         DO 16 I=1,99
104             ICHGE(I)=0
105             IF(I.GT.20) GO TO 16
106             IICHGE(I)=0
107     16  CONTINUE
108         NEW=0
109         NCHGE=0
110         SOLD=0.
111         EOLD=0.
112         IOUT=0
113         KOUT=0
114         K=0
115         I=0
116         N=0
117         PRINT 208
118         KOE=LOE
119         KOS=LOS
120         KE=LOE+50
121         KS=LOS
122         KOUNT=0
123     17  KOUNT=KOUNT+1
124         CALL BELL
125         IF(KOUNT.LE.3) GO TO 17
126         CALL TOUTST(3,IPLTON)
127     18  I=I+1
128     19  CALL MOVABS(KOE,KOS)
129         CALL TSEND
130         CALL PICK(IE,IS)
131         KOE=IE
132         KOS=IS
133         CALL MOVABS(KE,KS)
134         CALL TSEND
135         CALL PICK(IE,IS)
136         E(I)=EUNIT*(IE-KOE)

```

```

137      S(I)=SUNIT*(IS-KOS)
138      EOUT=ABS(E(I))
139      SOUT=ABS(S(I))
140      KOE=KOE/4
141      KOS=KOS/4
142      IF(EOUT.LT.XSTOP.AND.SOUT.GT.YSTOP) GO TO 20
143      IF(I.GE.50.AND.MOD(I,5).EQ.0) GO TO 20
144      IF(I.GE.90) GO TO 20
145      KE=IE/4
146      KS=IS/4
147      IF(I.GE.50.AND.K.EQ.0) GO TO 20
148      IF(K.GT.0) GO TO 21
149      GO TO 18
150  20    N=I
151      IF(EOUT.LT.XSTOP.AND.SOUT.GT.YSTOP) N=I-1
152  21    CALL TOUTST(3,IPLTOF)
153      CALL TSEND
154      KOUNT=0
155  22    KOUNT=KOUNT+1
156      CALL BELL
157      IF(KOUNT.LE.3) GO TO 22
158  C
159  C-----
160  C
161  C * * * * * WRITE-OUT OF DATA * * * * *
162  C
163  30    CALL NEWPAG
164      CALL DCURSR(IC,IXD,IYD)
165      CALL ANMODE
166      PRINT 209,N
167      READ 102,ANS
168      IF(ANS.EQ.'NON') GO TO 32
169      PRINT 210
170      IF(ANS.EQ.'ALL') PRINT 211,(I,S(I),E(I),ICHGE(I),I=1,N)
171      IF(ANS.EQ.'LAS') PRINT 211,N,S(N),E(N),ICHGE(N)
172      IF(ANS.EQ.'COR'.AND.NEW.GT.0) GO TO 31
173      IF(KOUT.GT.0) PRINT 219
174      IF(KOUT.EQ.1) PRINT 211,II(KOUT),SS(KOUT),EE(KOUT),IICHGE(KOUT)
175      IF(KOUT.GT.1)
176      1PRINT 211,(II(KI),SS(KI),EE(KI),IICHGE(KI),KI=1,KOUT)
177      GO TO 32
178  31    PRINT 220,NEW
179      PRINT 211,NEW,SOLD,EOLD,NCHGE
180      PRINT 221
181      PRINT 211,NEW,S(NEW),E(NEW),ICHGE(NEW)
182  C
183  C-----
184  C
185  C * 7 OPTIONS: PUNCH* ADD* CORRECT* DELETE* RECALIBRATE* REDIGITIZE* DISCARD*
186  C
187  32    PRINT 212
188      MX=6
189      READ(5,101,ERR=5),IANS
190      IF(IANS.EQ.1) GO TO 50
191      IF(IANS.EQ.2) GO TO 35
192      IF(IANS.EQ.4) GO TO 37
193      IF(IANS.EQ.5) GO TO 10
194      IF(IANS.EQ.6) GO TO 15
195      IF(IANS.EQ.7) GO TO 60
196  C
197  C-----
198  C
199  C * * * * * OPTION TO CORRECT DATA * * * * *
200  C
201      K=K+1
202  33    PRINT 213
203      MX=7
204      READ(5,101,ERR=5),I

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205      NEW=I
206      NCHGE=ICHGE(I)
207      SOLD=S(I)
208      EOLD=E(I)
209      ICHGE(I)=ICHGE(I)+1
210      KE=KOE+E(I)/(4*EUNIT)
211      KS=KOS+S(I)/(4*SUNIT)
212      KOUNT=0
213 34    KOUNT=KOUNT+1
214      CALL BELL
215      IF(KOUNT.LE.3) GO TO 34
216      CALL TOUTST(3,IPLTON)
217      GO TO 19
218  C
219  C-----
220  C
221  C * * * * * OPTION TO ADD DATA * * * * *
222  C
223 35    CALL NEWPAG
224      CALL DCURSR(IC,IXD,IYD)
225      CALL ANMODE
226      PRINT 214
227      KE=KOE+E(N)/(4*EUNIT)
228      KS=KOS+S(N)/(4*SUNIT)
229      K=0
230      I=N
231      KOUNT=0
232 36    KOUNT=KOUNT+1
233      CALL BELL
234      IF(KOUNT.LE.3) GO TO 36
235      CALL TOUTST(3,IPLTON)
236      GO TO 18
237  C
238  C-----
239  C
240  C * * * * * OPTION TO DELETE A POINT * * * * *
241  C
242 37    PRINT 215
243      MX=8
244      READ(5,101,ERR=5),IOUT
245      KOUT=KOUT+1
246      SS(KOUT)=S(IOUT)
247      EE(KOUT)=E(IOUT)
248      II(KOUT)=IOUT
249      IICHGE(KOUT)=-1
250      NX=N-1
251      IF(IOUT.EQ.N) GO TO 40
252      IF(IOUT.EQ.NX) GO TO 39
253      DO 38 I=IOUT,NX
254          E(I)=E(I+1)
255          S(I)=S(I+1)
256          ICHGE(I)=ICHGE(I+1)
257 38    CONTINUE
258      GO TO 40
259 39    E(NX)=E(N)
260      S(NX)=S(N)
261      ICHGE(NX)=ICHGE(N)
262 40    N=NX
263      GO TO 30
264  C
265  C-----
266  C
267  C * * CURVE IDENTIFIERS AND STRESS-STRAIN DATA PUNCHED ON CARDS *
268  C
269 50    NRUN=NRUN+1
270      IF(NRUN.GT.1) GO TO 51
271      PRINT 216
272      READ 101,NCOPY

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273      PUNCH 302,NPRINT,NCOPY
274 51    PUNCH 300,SND,WMTL,XMTL,YMTL,ZMTL,BOOK,NPAGE,TYPE,NDATE,
275      1KTEMP,KEDOT,N,PPL,AREA,PULT,ELONG,RA,RCH,ISET
276      PUNCH 301,(S(I),E(I),I,I=1,N)
277 C
278 C-----
279 C
280 C * * * * * CONTINUE WITH ANOTHER CURVE OR STOP * * *
281 C
282 60    CALL NEWPAG
283      CALL DCURSR(IC,IXD,IYD)
284      CALL ANMODE
285      PRINT 217
286      READ 102,ANS
287      IF(ANS.EQ.'YES') GO TO 1
288      PRINT 218
289      CALL FINITT(0,500)
290 C
291 C-----
292 C
293 C * * * * * READ FORMATS * * * * *
294 C
295 100    FORMAT(A6)
296 101    FORMAT( )
297 102    FORMAT(A3)
298 103    FORMAT(2A2,2A4,I5,I2)
299 104    FORMAT(A4,I2,I6,A5)
300 C
301 C-----
302 C
303 C * * * * * CRT WRITE-OUT FORMATS * * * * *
304 C
305 200    FORMAT(1H ,/,T2,'REFER TO PICPTS DATA SHEET FOR ENTRIES 1 TO 7',
306      1//,T2,'IF SCREEN ERASES DURING PROGRAM & X-Y AXES APPEAR',/,T2,
307      2'KEY SPACE BAR, THEN KEY RETURN TO CONTINUE',
308      3//,T2,12(' ',1X),//,T2,'ENTRY 1: SPECIMEN NUMBER')
309 201    FORMAT(T2,'ENTRY 2: PROP LIMIT AND ULT LOAD IN LBS',/,T2,
310      1'AREA IN SQ-IN, ELONG AND REDUCTION IN AREA IN PCT',/,T2,
311      2'HARDNESS AND SET NO. * ENTER -1. FOR UNAVAILABLE DATA',/,
312      3T2,'EXAMPLE: 6000.,9780...05,10.2,35.6,0.,22')
313 202    FORMAT(T2,'ENTRY 3: IF DESCRIPTORS SAME AS LAST RUN, ENTER YES',
314      1//,T2,'OTHERWISE ENTER NO')
315 203    FORMAT(T2,'ENTRY 4: MATERIAL DESCRIPTORS (2A2,2A4)',/,T2,
316      1'TEST TEMP AND EDOT EXPONENT (I5,I2)',/,T2,
317      2'EXAMPLES * ST1B 52100 20-4')
318 204    FORMAT(T2,'ENTRY 5: NOTEBOOK, PAGE, DATE & TEST TYPE',/,T2,
319      1'USE TENS, COMP, OR SHEAR FOR TEST TYPE ENTRY',/,T2,
320      2'EXAMPLE: 1A4602071977TENS')
321 205    FORMAT(T2,'ENTRY 6: IF PREVIOUS CALIBRATION IS VALID, ENTER YES',
322      1//,T2,'OTHERWISE ENTER NO')
323 206    FORMAT(T2,'ENTRY 7: CALIBRATION VALUES FOR STRESS AND STRAIN',
324      1//,T2,'EXAMPLE * 6000...02')
325 207    FORMAT(T2,'* PROCEDURE FOR CALIBRATING PLOTTER *',/,T2,
326      1'1. POSITION THE CROSS-HAIRS ON ZERO AND PUSH CALL',/,T2,
327      2'2. WAIT FOR CROSS-HAIRS TO RETURN TO ZERO',/,T2,
328      3'3. POSITION ON CALIBRATION POINT AND PUSH CALL')
329 208    FORMAT(T2,'*PROCEDURE FOR DIGITIZING*',/,T2,
330      1'EACH POINT REQUIRES TWO STEPS',/,T2,
331      2'DIGITIZE ZERO THEN DIGITIZE CURVE POINT',/,T2,
332      3'TO EXIT, DIGITIZE ZERO THEN DIGITIZE EXIT POINT')
333 209    FORMAT(T2,'NUMBER OF POINTS DIGITIZED: N=',I3,/,
334      1T2,'FOR A LISTING OF ALL DIGITIZED DATA ENTER ALL',/,
335      2T2,'FOR LAST POINT ONLY, ENTER LAST',/,
336      3T2,'FOR PRINT OF CORRECTED POINT ONLY, ENTER CORRECT',/,
337      4T2,'FOR PRINT OF DELETED POINT(S) ONLY, ENTER DELETE',/,
338      5T2,'TO OMIT ANY LISTING, ENTER NONE')
339 210    FORMAT(T2,'** LIST OF DIGITIZED VALUES **',/,T2,
340      1'*NUM CHGS= NUMBER OF TIMES GIVEN POINT HAS BEEN CORRECTED',/,

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341      2T2,'POINT',4X,'LOAD',3X,'STRAIN'3X,'NUM',/,T3,
342      3'NO.',5X,'LBS',4X,'IN/IN',4X,'CHGS',/)
343 211    FORMAT(T3,I3,3X,F7.0,1X,F7.5,3X,I2)
344 212    FORMAT(1H,/,T2,'* MAKE ONE OF SEVEN CHOICES *,/,T2,
345      1'1. ENTER 1 TO PUNCH DATA NOW',/,T2,
346      2'2. ENTER 2 TO ADD MORE DATA POINTS',/,T2,
347      3'3. ENTER 3 TO CORRECT ONE OR MORE POINTS',/,T2,
348      4'4. ENTER 4 TO DELETE ONE OR MORE POINTS',/,T2,
349      5'5. ENTER 5 TO RECALIBRATE & REDIGITIZE',/,T2,
350      6'6. ENTER 6 TO REDIGITIZE THIS CURVE',/,T2,
351      7'7. ENTER 7 TO DISCARD THIS SET OF DATA')
352 213    FORMAT(T2,'ENTER POINT NO. TO BE CORRECTED',/,T2,
353      1'WAIT FOR CROSS-HAIRS TO MOVE TO ZERO',/,T2,
354      2'USE TWO-STEP PROCEDURE TO CORRECT ONE POINT',/T2,
355      3'AUTOMATIC EXIT FROM PLOTTER AFTER ONE-POINT CORRECTION')
356 214    FORMAT(1H,/,T2,'* USE TWO-STEP PROCEDURE TO ADD DATA POINTS *,
357      1/,T2,'CROSS-HAIRS WILL MOVE TO ZERO & THEN TO LAST POINT',
358      2/,T2,'RESUME DIGITIZING',/,T2,
359      3'USE TWO-STEP PROCEDURE FOR EXIT POINT')
360 215    FORMAT(T2,'ENTER POINT NO. TO BE DELETED',/,T2,
361      1'DELETED POINT WILL BE LISTED WITH NUM CHGS=-1')
362 216    FORMAT(T4,'IF A PRINTED PI REPORT IS TO BE PREPARED',/,T2,
363      1'ENTER THE NUMBER OF COPIES REQUIRED',/,T2,
364      2'IF NO REPORT REQUIRED, ENTER 1')
365 217    FORMAT(T2,'IF YOU WISH TO DIGITIZE MORE CURVES,ENTER YES',
366      1/,T2,'OTHERWISE ENTER NO')
367 218    FORMAT(T2,'PLEASE SIGN OFF TERMINAL',/,T2,
368      1'1. IF ONLY CARDS REQD: ENTER @ADD R*PICPTS.STOP',/,T2,
369      2'2. IF CARDS & REPORT REQD: ENTER @ADD R*PICPTS.PRINT',/T2,
370      3'3. WAIT FOR MESSAGE: READY',/,T2,
371      4'IF PRINT REQUESTED, SENT BY T32 WILL ALSO APPEAR',/,T2,
372      5'4. THEN WHEN PROMPT (>) APPEARS ENTER @FIN')
373 219    FORMAT(/,T2,'** FOLLOWING DELETED (ORIGINAL POINT NOS.):')
374 220    FORMAT(T2,'** VALUES FOR POINT',I3,' BEFORE CORRECTION:')
375 221    FORMAT(/,T2,'CORRECTED VALUES:')
376 C
377 C-----
378 C
379 C * * * * * PUNCH FORMATS * * * * *
380 C
381 300    FORMAT(A6,2A2,3A4,I2,A5,I6,I5,2I2,F7.0,F6.4,F7.0,3F4.1,I4)
382 301    FORMAT(F7.0,F7.5,63X,I3)
383 302    FORMAT(I2,2X,I2)
384 C
385 C-----
386 C
387 C * * * * * ERROR DIAGNOSTIC FORMAT * * * * *
388 C
389 400    FORMAT(T2,'*** ERROR IN DATA JUST ENTERED ***',/,T2,
390      1'TO CORRECT, ENTER: YES',/,T2,
391      2'TO TERMINATE EXECUTION ENTER: NO')
392 C
393      END

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1 C-----
2     SUBROUTINE PICK(IX,IY)
3 C-----
4 C
5 C * DIGITIZES LOAD STRAIN CURVES ON TEKTRONIX 4662 DIGITAL PLOTTER
6 C * FULL SCALE PLOTTER RANGE: X=4095 UNITS AND Y=2731 UNITS
7 C * PLOTTER COORDINATES SCALED TO LOAD AND STRAIN IN MAIN PROGRAM
8 C
9 C-----
10 C
11     DIMENSION IN(7)
12     CALL TINSTR(7,IN)
13     IX=0
14     IY=0
15     DO 200 I=1,5,2
16         IDX=MOD(IN(I),32)
17         IX=IX+32+IDX
18         IDY=MOD(IN(I+1),32)
19         IY=IY+32+IDY
20 200 CONTINUE
21     IX=IX/8
22     IY=IY/8
23     RETURN
24 C
25     END

```

```

1 @ASG,UP PUN
2 @FREE PUN
3 @ASG,A PUN
4 @BRKPT PUNCH$/PUN
5 @XQT R=PICPTS.PICKEM

```

```

1 @BRKPT PUNCH$
2 @FREE PUN
3 @SYM,C PUN,,RM9301

```

```

1 @ASG,A R=EVALRO.
2 @BRKPT PUNCH$
3 @FREE PUN
4 @DAO*UTIL.SUSPEND
5 @XQT R=EVALRO.FITDATA
6 @ADD PUN.
7 @DAO*UTIL.RESUME,P RM9301
8 @SYM,C PUN,,RM9301

```

```

1 @PREP R=PICPTS.
2 @MAP,I CIS,R=PICPTS.PICKEM
3 IN R=PICPTS.MAIN
4 IN R=PICPTS.BUFFPK
5 LIB R=PICPTS.
6 LIB DAO*TEX.
7 END
8 @PACK R=PICPTS.
9 @PRT,TL R=PICPTS.

```

LISTING OF R*EVALRO

The EVALRO file consists of the following symbolic elements:

Element	Function
MAIN	Main program for analysis of stress-strain data
ORDER	Subroutine to arrange the input data in increasing order of strain magnitude
LSTSQ	Subroutine to perform a linear least-squares analysis
RJA75	Subroutine for numerical solution of an equation of the form: $Z + AX^n + B = 0$
START	Control routine used to assign LOCATER file to run and to execute the program
MAP1	Control routine used to PREP the file, form the absolute (name: FITDATA), PACK the file, and print a list of file elements.

EVALRO is a batch process program executed from the UNIVAC 9300 hard-copy terminal using punch card input or from an interactive graphics terminal using a file of punch card images. The hard-copy output on both cases appears at the UNIVAC 9300 terminal.

Listings for the main program and the three subroutines are given on pages 11-25. The two control routines are listed, in the order given above, on page 26.

```

1 C-----
2 C * THIS IS THE MAIN PROGRAM OF THE FILE R-EVALRO (ABSOLUTE: FITDATA)
3 C-----
4 C
5 C * THE FILE ALSO CONTAINS 3 SUBROUTINES
6 C * THE SUBROUTINES ARE: ORDER, LSTSQ, AND RJA75
7 C * PROGRAM DOES BEST-FIT R-O ANALYSIS & PREPARES OUTPUT DATA FOR DATA BANK
8 C
9 C-----
10 C
11     DIMENSION S(99),E(99),P(99),EP(99),X(99),Y(99),CS(10,99),
12     1DBAR(10,5),SBAR(10,5),DEL(10,5),CC(10,5),SEE(10,5),SEEM(10,5),
13     2SY(10),SYM(10),XN(10),ISPTS(10,5),IEP(10),NEP(10),IAPTS(10),
14     3JOUT(10),SPL(10),SY1(10),SPLM(10),SY1M(10),DEV(10,99),KEP(99),
15     4IOUT(99),WA(7),XA(19),LOC(7,19),WOUT(99),XOUT(99),ISOUT(99),
16     5JPCH(99)
17 C
18     DATA WA/'ST','TI','UR','CU','WF','AL','MG'/
19     DATA XA/'ZZ','1A','2A','3A','4A','5A','6A','7A','8A','9A',
20     1'1B','2B','3B','4B','5B','6B','7B','8B','9B'/
21 C
22     SCONV=1.E-3
23     SMETRC=6.89476
24     NRUN=0
25 C
26 C-----
27 C
28     READ 100,NPRINT,NPUNCH,NCOPY
29 C
30 C * NPRINT IS A PRINT-OUT OPTION CODE
31 C * NPRINT=0 * ONLY BEST-FIT PARAMETERS AND STATISTICS PRINTED
32 C * NPRINT=1 * PI REPORT * DATA FOR NPRINT=0 AND TABLE
33 C * TABLE LISTS INPUT DATA,CALC STRESS & DEVIATION FOR BEST-FIT ONLY
34 C * NPRINT=2 * ALL TRIAL PARAMETERS AND STATISTICS PRINTED
35 C * NPRINT=3 * PRINT OUT OF NPRINT=2 DATA AND TABLE: LISTING NEXT LINE
36 C * TABLES LIST INPUT DATA, CALC-S, AND PCT DEV OF CALC-S FROM INPUT-S
37 C
38 C * NPUNCH IS PUNCH-OUT OPTION CODE
39 C * NPUNCH=1: PUNCH OUT DATA * NPUNCH=0: NO PUNCH
40 C
41 C * NCOPY INDICATES NUMBER OF COPIES OF NPRINT=1 REQUIRED
42 C * IF NO ENTRY (NCOPY=0) PROGRAM DEFAULTS TO NCOPY=1
43 C
44 C-----
45 C
46 C * INITIAL VALUES FOR DATA BANK PREPARATION VARIABLES
47 C * FILE 10 IS THE LOCATER FILE FOR DATABANK
48 C
49     IF(NPUNCH.EQ.0) GO TO 1
50     DEFINE FILE 10(50,80,E,JJ)
51     DO 80 JX=1,7
52     READ(10,JX,502),WA(JX),(LOC(JX,JK),JK=1,19)
53 80 CONTINUE
54     DO 81 JP=1,99
55     JPCH(JP)=0
56     WOUT(JP)=0
57     XOUT(JP)=0
58     ISOUT(JP)=0
59 81 CONTINUE
60 C
61 C-----
62 C
63 1     NRUN=NRUN+1
64     NPX=NRUN-1
65     KPRT=0
66 C
67 C-----
68 C

```



```

69 C * READ-IN OF MATERIAL AND TEST DESCRIPTORS AND LOAD-STRAIN DATA:
70 C * SNO= SPEC NO; W,X,Y,ZMTL= MATL DESCRIPTORS; BOOK,NPAGE=NOTEBOOK REF;
71 C * TYPE=TENS, COMP, OR SHEAR; NDATE=TEST DATE; KTEMP=TEST TEMP;
72 C * KEDOT= LOG OF STRAIN RATE; N= NO OF DATA POINTS; PPL= PROP LIMIT LOAD;
73 C * AREA=SPEC AREA IN SQ-IN; PULT=ULTIMATE LOAD IN LBS;
74 C * ELONG=ELONGATION & RA=RED'N IN AREA BOTH IN PCT;
75 C * RCH=ROCKWELL C HARDNESS; ISET=DATABANK SET NO.
76 C
77       READ(5,101,END=999),SNO,WMTL,XMTL,YMTL,ZMTL,BOOK,NPAGE,TYPE,
78       1NDATE,KTEMP,KEDOT,N,PPL,AREA,PULT,ELONG,RA,RCH,ISET
79 C
80 C -----
81 C
82 C * INITIAL VALUES ESTABLISHED FOR SELECTED VARIABLES
83 C
84       NEND=0
85       DO 3 J=1,10
86         IEP(J)=0
87         NEP(J)=0
88         JOUT(J)=0
89         DO 2 L=1,5
90           SBAR(J,L)=0.
91           DBAR(J,L)=0.
92           DEL(J,L)=0.
93       2       CC(J,L)=0.
94       3       CONTINUE
95 C
96 C -----
97 C
98 C * READ-IN OF LOAD-STRAIN DATA AND CONVERSION OF LOAD TO STRESS
99 C * P= LOAD IN POUNDS; S= STRESS IN PSI; E= STRAIN IN IN/IN
100 C
101       DO 4 I=1,N
102         READ 102,P(I),E(I)
103       4       S(I)=P(I)/AREA
104         PPL=PPL/AREA
105         SULT=PULT*SCONV/AREA
106         SULTM=SULT*SMETRC
107 C
108 C -----
109 C
110 C * S-E DATA MUST BE ORDERED IN INCREASING VALUES OF STRAIN MAGNITUDE
111 C * IF NOT, SUBROUTINE ORDER REARRANGES S-E DATA
112 C * IF MORE THAN N ITERATIONS REQUIRED FOR ORDERING RUN IS ABORTED
113 C
114       MORDER=0
115       NL=N-1
116       DO 5 I=1,NL
117         IF(E(I).LE.E(I+1)) GO TO 5
118         GO TO 6
119       5       CONTINUE
120         GO TO 7
121       6       CALL ORDER(N,S,E,P,MORDER)
122         IF(MORDER.EQ.0) GO TO 7
123         GO TO 31
124 C
125 C -----
126 C
127 C * ELASTIC DATA ANALYSIS FOR MODULUS AND INTERCEPT USING LSTSQ *
128 C * STRAIN INTERCEPT SUBTRACTED FROM ALL STRAINS SO S-E CURVE GOES THRU ZERO
129 C * RESULTING NET STRAIN USED IN CALCULATIONS. CALLED ADJUSTED (ADJ) STRAIN
130 C * EP= PLASTIC STRAIN COMPONENT; EP USED LATER TO CALCULATE R-O PARAMETERS
131 C
132       I=0
133       8       I=I+1
134         IF(S(I).GT.PPL.OR.I.EQ.N) GO TO 9
135         GO TO 8
136       9       IPL=I

```



```

137      IE=IPL-1
138      DO 10 I=1,IE
139      X(I)=E(I)
140 10    Y(I)=S(I)
141      LI=1
142      LJ=IE
143      CALL LSTSQ(X,Y,SL,OF,LI,LJ)
144      EMOD=SL
145      EINT=-OF/SL
146      K=IPL
147      NJ=N
148      DO 11 I=1,N
149      E(I)=E(I)-EINT
150      EP(I)=E(I)-S(I)/EMOD
151      IF(I.LT.K) GO TO 11
152      IF(E(I-1).LE..02.AND.E(I).GT..02) NJ=I-1
153      IF(EP(I).LE.0) K=I+1
154      IF(EP(I).LT..00005) IJ=I+1
155 11    CONTINUE
156      IF(EP(K).GE..00005) IJ=K
157      INTCPT=EINT*1.E+6
158      POF=OF
159      OFM=OF*SCONV*SMETRC
160  C
161  C-----
162  C
163  C * IDENTIFICATION OF DATA POINT WHOSE EP VALUE CLOSEST TO .002 IN/IN
164  C * STRESS VALUE OF THIS POINT IS APPROXIMATE GRAPHIC YIELD STRESS
165  C
166  C * LEND= INDICATOR OF EXTENT OF DATA; S(N)=STRESS VALUE OF LAST DATA POINT
167  C * LEND=3 * S(N) LE GRAPHIC YIELD
168  C * LEND=4 * NO MORE THAN 3 DATA POINTS BETWEEN S(N) AND GRAPHIC YIELD
169  C * LEND=5 * AT LEAST 4 DATA POINTS GT GRAPHIC YIELD
170  C
171      IF(EP(N).GE..002) GO TO 12
172      IY=N
173      LEND=3
174      GO TO 16
175 12    I=IE
176 13    I=I+1
177      IF(EP(I)-.002) 13,14,15
178 14    IY=I
179      LEND=3
180      IF(IY.EQ.N) GO TO 16
181 15    IY=I-1
182      NPTS=N-IY
183      IF(NPTS.LT.4) LEND=4
184      IF(NPTS.GE.4) LEND=5
185  C
186  C-----
187  C
188  C * TEN PAIRS OF TRIAL VALUES OF XN AND SY COMPUTED BY LOG-LEAST SQUARES
189  C
190  C * SETTING LOWER BOUND VALUES OF EP FOR LOG-LSTSQ ANALYSES
191  C * UPPER BOUND IS INPUT VALUE WHOSE EP IS CLOSEST TO .002
192  C * IF FEWER THAN 8 PTS FOR LOG-LSTSQ, UPPER BOUND EXTENDED TO GET 8 PTS
193  C
194 16    IJ=IJ-1
195      DO 17 J=1,10
196      IJ=IJ+1
197      IEP(J)=IJ
198      NEP(J)=EP(IJ)*1.E6
199 17    CONTINUE
200  C
201  C-----
202  C
203  C * LOG-LEAST SQUARES ANALYSES DONE BY SUBROUTINE LSTSQ
204  C

```

```

205      DO 18 I=K,N
206      X(I)=ALOG(EP(I))
207 18    Y(I)=ALOG(S(I))
208      CONST=ALOG(.002)
209      LJ=IY
210      DO 19 J=1,10
211      LI=IEP(J)
212      NPTS=LJ-LI
213      IF(NPTS.LT.7) LJ=LI+7
214      IF(LJ.GT.N) LJ=N
215      IAPTS(J)=LJ-LI+1
216      CALL LSTSQ(X,Y,SL,OF,LI,LJ)
217      AS=OF+SL*CONST
218      SY(J)=EXP(AS)
219      XN(J)=1./SL
220 19    CONTINUE
221  C
222  C-----
223  C
224  C * COMPUTATION OF ANALYTIC STRESS VALUES FOR EACH INPUT STRAIN UP TO EPS=.02
225  C * DONE USING A TRIAL AND ERROR PROCEDURE BY SUBROUTINE RJA75
226  C
227  C * COMPUTATION ABORTED FOR ANY ONE OF THREE CONDITIONS
228  C * NO SOLUTION IN 100 ITERATIONS: ITER=100 & JOUT=1
229  C * INCREMENTED VALUE OF Z TOO LARGE: ITER=200 & JOUT=2
230  C * INCREMENTED VALUE OF Z LESS THAN .01: ITER=300 & JOUT=3
231  C * NEND COUNTS THE NUMBER OF J'S THAT ABORT *
232  C
233  C * ABORTS OCCUR ONLY IF MAGNITUDES OF INPUT DATA ARE GROSSLY IN ERROR
234  C
235      LI=K
236      DO 21 J=1,10
237      B=EMOD/SY(J)
238      AA=.002*B
239      XP=XN(J)
240      DO 20 I=LI,NJ
241      Z=1
242      BB=B+E(I)
243      CALL RJA75(Z,XP,BB,AA,ITER)
244      IF(ITER.LT.100.AND.ITER.GE.1) GO TO 20
245      IF(ITER.EQ.0) JOUT(J)=9
246      IF(ITER.EQ.100) JOUT(J)=1
247      IF(ITER.EQ.200) JOUT(J)=2
248      IF(ITER.EQ.300) JOUT(J)=3
249      IOUT(J)=I
250      NEND=NEND+1
251      GO TO 21
252 20    CS(J,I)=Z*SY(J)
253 21    CONTINUE
254  C
255  C-----
256  C
257  C * STATISTICAL EVALUATION OF FIT OF TEST DATA
258  C
259  C * CC= CORRELATION COEFFICIENT; SEE= STANDARD ERROR OF ESTIMATE
260  C * PREFIX E= ELASTIC DATA
261  C
262  C * L IS INDICATOR OF REGION OF S-E CURVE WHICH IS STATISTICALLY EVALUATED
263  C * MIDPT= NUMBER OF DATA POINT CLOSEST TO MEDIAN STRESS BETWEEN SPL & SY
264  C * L=1 * SPL TO MIDPT
265  C * L=2 * MIDPT TO SY
266  C * L=3 * SPL TO SY (OR TO S(N) IF S(N) LT SY)
267  C * L=4 * SPL TO S(N) (USED ONLY IF LEND GE 4)
268  C * L=5 * SY TO S(N) (USED ONLY IF LEND EQ 5)
269  C
270  C * ELASTIC MODULUS EVALUATION
271  C
272      ECC=0.

```

```

273     ESBAR=0.
274     EDBAR=0.
275     EDEL=0.
276     LJ=K-1
277     DO 22 I=1,LJ
278 22    ESBAR=ESBAR+S(I)/LJ
279     DO 23 I=1,LJ
280     ECS=E(I)*EMOD
281     EDBAR=EDBAR+(S(I)-ESBAR)**2
282 23    EDEL=EDEL+(S(I)-ECS)**2
283     ESEE=SQRT(EDEL/LJ)
284     COR=1.-EDEL/EDBAR
285     IF(COR.GT.0) ECC=SQRT(COR)
286  C
287  C * R-O EQUATION EVALUATION: CALCULATIONS FOR EACH SET OF TRIAL PARAMETERS
288  C
289  C * UPPER LIMIT OF INDEX I IS N, IF E(N) LESS THAN .02
290  C * UPPER LIMIT OF I IS NJ, IF E(N) GREATER THAN .02
291  C * E(NJ) IS VALUE OF STRAIN JUST BELOW OR EQUAL TO .02
292  C
293     IF(NEND.EQ.10) GO TO 29
294     DO 27 J=1,10
295     IF(JOUT(J).GT.0) GO TO 27
296     MIDPT=K+(IY-K)/2
297     DO 26 L=1,LEND
298     IF(L.NE.2.AND.L.NE.5) LI=K
299     IF(L.EQ.2) LI=MIDPT+1
300     IF(L.EQ.5) LI=IY+1
301     IF(L.EQ.1) LJ=MIDPT
302     IF(L.EQ.2.OR.L.EQ.3) LJ=IY
303     IF(L.GE.4) LJ=NJ
304     ISPTS(J,L)=LJ-LI+1
305     DO 24 I=LI,LJ
306 24    SBAR(J,L)=SBAR(J,L)+S(I)/ISPTS(J,L)
307     DO 25 I=LI,LJ
308     DBAR(J,L)=DBAR(J,L)+(S(I)-SBAR(J,L))**2
309 25    DEL(J,L)=DEL(J,L)+(S(I)-CS(J,I))**2
310     SEE(J,L)=SQRT(DEL(J,L)/ISPTS(J,L))
311     COR=1.-DEL(J,L)/DBAR(J,L)
312     IF(COR.GT.0) CC(J,L)=SQRT(COR)
313 26    CONTINUE
314 27    CONTINUE
315  C
316  C-----
317  C
318  C * BEST-FIT CRITERION: TRIAL VALUES OF XN & SY WHICH GIVE MAX CC FOR SPL TO SY
319  C
320     IF(NEND.EQ.10) GO TO 29
321     J1=1
322     COR=0.
323     DO 28 J=1,10
324     IF(JOUT(J).GT.0) GO TO 28
325     CRIT=CC(J,3)
326     IF(CRIT.LE.COR) GO TO 28
327     COR=CRIT
328     J1=J
329 28    CONTINUE
330  C
331  C-----
332  C
333  C * UNITS CONVERSION FOR PRINT-OUT OF NPRINT=0 OR 1 AND PUNCH-OUT
334  C * S & SEE CONVERTED TO KSI & MPA; MODULUS TO MEGA-PSI & GPA
335  C * TEST TYPE CODED FOR PUNCH-OUT: TYPE TO NTYPE
336  C * PROP-LIM (SPL) AND .1%-YLD (SY1) CALCULATED
337  C
338 29    EMOD=EMOD*1.E-6
339     EMODM=EMOD*SMETRC
340     ESEE=ESEE*SCONV

```

```

341      ESEEM=ESEE*SMETRC
342      NTYPE=0
343      IF(TYPE.EQ.'TENS ') NTYPE=1
344      IF(TYPE.EQ.'COMP ') NTYPE=2
345      IF(TYPE.EQ.'SHEAR') NTYPE=3
346      IF(NPRINT.GT.1) GO TO 37
347      IF(NEND.EQ.10) GO TO 31
348      SY(J1)=SY(J1)*SCONV
349      SYM(J1)=SY(J1)*SMETRC
350      XP=1./XN(J1)
351      SPL(J1)=SY(J1)*.005**XP
352      SPLM(J1)=SPL(J1)*SMETRC
353      SY1(J1)=SY(J1)*.5**XP
354      SY1M(J1)=SY1(J1)*SMETRC
355      DO 30 L=1,LEND
356      SEE(J1,L)=SEE(J1,L)*SCONV
357 30    SEEM(J1,L)=SEE(J1,L)*SMETRC
358      C
359      C-----
360      C
361      C * PRINT-OUT AND PUNCH OUT ROUTINES
362      C * DATA BANK PREPARATION AND PUNCH-OUT START AT STATEMENT NUMBER 65
363      C
364      C-----
365      C
366      C * NPRINT=0: PRINT-OUT OF BEST-FIT PARAMETERS * FOUR SETS PER PAGE
367      C * NPRINT=1: PI REPORT * BEST-FIT PARAMETERS, STATISTICS, AND TABLE
368      C
369 31    IF(MOD(NPX,4).EQ.0.AND.NPRINT.EQ.0) PRINT 200
370      IF(NPRINT.EQ.1) PRINT 208,AREA
371      KPRT=KPRT+1
372      PRINT 201,SNO,WMTL,XMTL,YMTL,ZMTL,TYPE,NDATE,BOOK,NPAGE,ISET,
373      1KTEMP,KEDOT,SULT,SULTM,ELONG,RA,RCH
374      IF(MORDER.EQ.0) GO TO 32
375      PRINT 300
376      IF(MOD(NRUN,4).EQ.0.OR.NPRINT.EQ.1) PRINT 218
377      GO TO 1
378 32    PRINT 202
379      PRINT 203,INTCPT,EMOD,ESEE,ECC,IE
380      IF(NEND.LT.10) PRINT 204,NEP(J1),SY(J1),XN(J1),IAPTS(J1),SPL(J1),
381      1SY1(J1)
382      PRINT 205,EMDDM,ESEEM
383      IF(NEND.LT.10) GO TO 33
384      PRINT 301
385      IF(MOD(NRUN,4).EQ.0.OR.NPRINT.EQ.1) PRINT 218
386      IF(NPRINT.EQ.1) GO TO 53
387      GO TO 65
388 33    KIN=0
389      PRINT 206,SYM(J1),SPLM(J1),SY1M(J1)
390      IF(NEND.EQ.0) GO TO 35
391      DO 34 J=1,10
392      IF(JOUT(J).EQ.0) GO TO 34
393      IF(KIN.EQ.0) PRINT 302,J,JOUT(J),IOUT(J)
394      IF(KIN.EQ.1) PRINT 303,J,JOUT(J),IOUT(J)
395      IF(KIN.EQ.2) PRINT 304,J,JOUT(J),IOUT(J)
396      IF(KIN.EQ.3) PRINT 305,J,JOUT(J),IOUT(J)
397      IF(KIN.EQ.4) PRINT 306,J,JOUT(J),IOUT(J)
398      IF(KIN.EQ.5) PRINT 307,J,JOUT(J),IOUT(J)
399      IF(KIN.EQ.6) PRINT 308,J,JOUT(J),IOUT(J)
400      IF(KIN.EQ.7) PRINT 309,J,JOUT(J),IOUT(J)
401      IF(KIN.EQ.8) PRINT 310,J,JOUT(J),IOUT(J)
402      KIN=KIN+1
403 34    CONTINUE
404 35    IF(KIN.EQ.0) PRINT 207
405      PRINT 210
406      PRINT 211,(SEE(J1,L),CC(J1,L),ISPTS(J1,L),L=1,3)
407      IF(LEND.EQ.4) PRINT 212,SEE(J1,4),CC(J1,4),ISPTS(J1,4)
408      IF(LEND.EQ.5) PRINT 213,(SEE(J1,L),CC(J1,L),ISPTS(J1,L),L=4,5)

```



```

409      PRINT 214, (SEEM(J1,L), L=1,3)
410      IF(LEND.EQ.4) PRINT 215, SEEM(J1,4)
411      IF(LEND.EQ.5) PRINT 216, (SEEM(J1,L), L=4,5)
412      PRINT 217
413      IF(MOD(NRUN,4).EQ.0.OR.NPRINT.EQ.1) GO TO 36
414      GO TO 65
415 36    PRINT 218
416      IF(NPRINT.EQ.1) GO TO 53
417      GO TO 65
418  C
419  C-----
420  C
421  C * ALTERNATE FULL-DATA PRINT-OUT AND OPTIONAL TABLES: NPRINT=2 OR 3
422  C
423  C-----
424  C
425  C * DIAGNOSTIC MESSAGE IF ANALYTIC STRESSES CANNOT BE CALCULATED
426  C
427 37    IF(NEND.LT.10) GO TO 38
428      PRINT 400
429      PRINT 401
430      PRINT 201, SNO, WMTL, XMTL, YMTL, ZMTL, TYPE, NDATE, BOOK, NPAGE, ISET,
431      1KTEMP, KEDOT, SULT, SULTM, ELONG, RA, RCH
432      PRINT 402, EMOD, POF, INTCPT, ESEE, ECC, IE
433      PRINT 403, EMODM, OFM, ESEEM
434      PRINT 301
435      IF(NPRINT.EQ.3) PRINT 315
436      PRINT 217
437      GO TO 65
438  C
439  C-----
440  C
441  C * UNITS CONVERSION FOR PRINT-OUT OF NPRINT=2 OR 3
442  C * PER-CENT DEVIATIONS CALCULATED ONLY FOR NPRINT=3 *
443  C
444 38    DO 41 J=1,10
445      IF(JOUT(J).GT.0) GO TO 41
446      SY(J)=SY(J)*SCONV
447      SYM(J)=SY(J)*SMETRC
448      XP=1./XN(J)
449      SPL(J)=SY(J)*.005**XP
450      SPLM(J)=SPL(J)*SMETRC
451      SY1(J)=SY(J)*.5**XP
452      SY1M(J)=SY1(J)*SMETRC
453      DO 39 L=1,LEND
454      SEE(J,L)=SEE(J,L)*SCONV
455      SEEM(J,L)=SEE(J,L)*SMETRC
456 39    CONTINUE
457      IF(NPRINT.EQ.1) GO TO 41
458      DO 40 I=K,NJ
459      DEV(J,I)=(CS(J,I)-S(I))*100./S(I)
460      CS(J,I)=CS(J,I)*SCONV
461 40    CONTINUE
462 41    CONTINUE
463      IF(NPRINT.EQ.2) GO TO 43
464      DO 42 I=K,NJ
465      KEP(I)=EP(I)*1.E6
466      S(I)=S(I)*SCONV
467 42    CONTINUE
468  C
469  C-----
470  C
471  C * PRINT-OUT OF ALL TRIAL PARAMETERS * ONE PAGE PER DATA SET: NPRINT=2
472  C
473 43    PRINT 400
474      PRINT 401
475      PRINT 201, SNO, WMTL, XMTL, YMTL, ZMTL, TYPE, NDATE, BOOK, NPAGE, ISET,
476      1KTEMP, KEDOT, SULT, SULTM, ELONG, RA, RCH

```



```

477      PRINT 402,EMOD,POF,INTCPT,ESEE,ECC,IE
478      PRINT 403,EMODM,OFM,ESEEM
479      PRINT 404
480      DO 45 J=1,10
481      IF(JOUT(J).GT.0) GO TO 44
482      PRINT 405,J,NEP(J),XN(J),SY(J),SYM(J),SPL(J),SPLM(J),
483      1SY1(J),SY1M(J),IAPTS(J)
484      IF(J.EQ.J1) PRINT 406
485      GO TO 45
486 44      PRINT 316,J,NEP(J),JOUT(J)
487 45      CONTINUE
488 C
489 C * PRINT-OUT OF STATISTICAL DATA FOR ALL TRIAL VALUES OF PARAMETERS *
490 C
491      PRINT 409
492      DO 47 J=1,10
493      IF(JOUT(J).GT.0) GO TO 46
494      PRINT 410,J,NEP(J),(SEE(J,L),SEEM(J,L),CC(J,L),ISPTS(J,L),L=1,3)
495      IF(LEND.EQ.3) PRINT 411
496      IF(LEND.EQ.4) PRINT 412,SEE(J,4),SEEM(J,4),CC(J,4),ISPTS(J,4)
497      IF(LEND.EQ.5) PRINT 413,(SEE(J,L),SEEM(J,L),CC(J,L),ISPTS(J,L),
498      1L=4,5)
499      GO TO 47
500 46      PRINT 317,J,NEP(J),JOUT(J)
501 47      CONTINUE
502 C
503 C-----
504 C
505 C * PRINT-OUT OF DIAGNOSTIC MESSAGES IF ANALYTIC STRESS CALCULATIONS ABORTED
506 C * MESSAGES APPEAR AT BOTTOM OF ONE-PAGE PRINTOUT OF PARAMETERS *
507 C
508      IF(NEND.GT.0) PRINT 318
509      PRINT 217
510      IF(NPRINT.EQ.2) GO TO 65
511 C
512 C-----
513 C
514 C * PRINT-OUT OF OPTIONAL TABLES: NPRINT=3
515 C * TABLES IN TWO GROUPS: J=1 TO J=5 AND J=6 TO J=10
516 C * INDEX LIMITS ARE: JK=1 TO JL=5 AND JK=6 TO JL=10
517 C
518      JK=1
519 48      JL=JK+4
520      PRINT 414,SNO
521      IF(JK.EQ.1) PRINT 415
522      IF(JK.EQ.6) PRINT 416
523      PRINT 417,(NEP(J),J=JK,JL)
524      KOUNT=0
525      IF(NEND.GT.0) GO TO 50
526      DO 49 I=K,NJ
527      KOUNT=KOUNT+1
528      PRINT 418,I,E(I),S(I),KEP(I),(CS(J,I),DEV(J,I),J=JK,JL)
529      IF(MOD(KOUNT,5).EQ.0) PRINT 207
530 49      CONTINUE
531      IF(JK.EQ.6) GO TO 65
532      JK=6
533      GO TO 48
534 50      DO 51 I=K,NJ
535      KOUNT=KOUNT+1
536      PRINT 419,I,E(I),S(I),KEP(I)
537      DO 51 J=JK,JL
538      IF(JOUT(J).GT.0) GO TO 51
539      IF(J.EQ.JK) PRINT 420,CS(J,I),DEV(J,I)
540      IF(J.EQ.(JK+1)) PRINT 421,CS(J,I),DEV(J,I)
541      IF(J.EQ.(JK+2)) PRINT 422,CS(J,I),DEV(J,I)
542      IF(J.EQ.(JK+3)) PRINT 423,CS(J,I),DEV(J,I)
543      IF(J.EQ.(JK+4)) PRINT 424,CS(J,I),DEV(J,I)
544 51      CONTINUE

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545      IF(MOD(KOUNT,5).EQ.0) PRINT 207
546 52   CONTINUE
547      PRINT 425
548      IF(JK.EQ.6) GO TO 65
549      JK=6
550      GO TO 48
551 C
552 C -----
553 C
554 C * PI REPORT UNITS CONVERSION AND TABULAR PRINT-OUT: NPRINT=1
555 C
556 53   IF(KPRT.GT.1) GO TO 57
557      PEMOD=EMOD*1.E6
558      IF(N.LE.60) IJ=N
559      IF(N.GT.60) IJ=60
560      DO 56 I=1,IJ
561      IF(I.GE.K) GO TO 54
562      CS(J1,I)=PEMOD*E(I)
563      KEP(I)=0
564 54   IF(I.GE.K) KEP(I)=EP(I)*1.E6
565      IF(I.GE.K.AND.NEND.EQ.10) GO TO 55
566      IF(I.GT.NJ) GO TO 55
567      DEV(J1,I)=(CS(J1,I)-S(I))*100./S(I)
568      CS(J1,I)=CS(J1,I)*SCONV
569 55   S(I)=S(I)*SCONV
570 56   CONTINUE
571 57   PRINT 217
572      IF(NEND.EQ.10) PRINT 319,SNO
573      IF(NEND.LT.10) PRINT 426,SNO,SY(J1),XN(J1),EMOD
574      IF(N.GT.30) GO TO 59
575      PRINT 427
576      DO 58 I=1,N
577      IF(I.LT.K) PRINT 428,
578      1I,P(I),E(I),KEP(I),S(I),CS(J1,I),DEV(J1,I)
579      IF(I.GE.K.AND.I.LE.NJ.AND.NEND.LT.10) PRINT 428,
580      1I,P(I),E(I),KEP(I),S(I),CS(J1,I),DEV(J1,I)
581      IF(I.GE.K.AND.NEND.EQ.10) PRINT 429,
582      1I,P(I),E(I),KEP(I),S(I)
583      IF(I.GE.K.AND.I.GT.NJ.AND.NEND.LT.10) PRINT 429,
584      1I,P(I),E(I),KEP(I),S(I)
585 58   CONTINUE
586      IF(NEND.GT.0) PRINT 318
587      IF(KPRT.LT.NCOPY) GO TO 31
588      GO TO 65
589 59   PRINT 430
590      IF(N.LE.60) LJ=N
591      IF(N.GT.60) LJ=60
592      DO 64 I=1,30
593      IP=30+I
594      IF(IP.LE.LJ) GO TO 61
595      IF(I.GT.NJ) GO TO 60
596      IF(NEND.EQ.10.AND.I.GE.K) GO TO 60
597      PRINT 428,I,P(I),E(I),KEP(I),S(I),CS(J1,I),DEV(J1,I)
598      GO TO 64
599 60   PRINT 429,I,P(I),E(I),KEP(I),S(I)
600      GO TO 64
601 61   IF(NEND.EQ.10.AND.I.GE.K) GO TO 62
602      IF(NEND.LT.10.AND.I.LE.NJ.AND.IP.GT.NJ) GO TO 63
603      PRINT 431,I,P(I),E(I),KEP(I),S(I),CS(J1,I),
604      1DEV(J1,I),IP,P(IP),E(IP),KEP(IP),S(IP),CS(J1,IP),DEV(J1,IP)
605      GO TO 64
606 62   PRINT 432,I,P(I),E(I),KEP(I),S(I),
607      1IP,P(IP),E(IP),KEP(IP),S(IP)
608      GO TO 64
609 63   PRINT 433,I,P(I),E(I),KEP(I),S(I),CS(J1,I),DEV(J1,I),IP,P(IP),
610      1E(IP),KEP(IP),S(IP)
611 64   CONTINUE
612      IF(N.GT.60) PRINT 434,N

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613         IF(NEND.GT.0.AND.N.LE.60.AND.NJ.GE.N) PRINT 318
614         IF(N.GT.60.AND.N.GT.NJ.AND.NJ.LE.60) PRINT 435
615         IF(N.LE.60.AND.NJ.LT.N) PRINT 436
616         IF(KPRT.LT.NCOPY) GO TO 31
617 C
618 C-----
619 C
620 C * PREPARATION OF DATA FOR DATA BANK
621 C * ASSIGNMENT OF NEXT VALUES AND UPDATE OF LOCATER VALUES
622 C
623 65      IF(NPUNCH.EQ.0) GO TO 1
624          NEXT=0
625          JW=0
626          JL=0
627          DO 66 JX=1,7
628              IF(WMTL.NE.WA(JX)) GO TO 66
629              JW=JX
630              GO TO 67
631 66      CONTINUE
632 67      IF(JW.EQ.0) GO TO 70
633          DO 68 LL=1,19
634              IF(XMTL.NE.XA(LL)) GO TO 68
635              JL=LL
636              GO TO 69
637 68      CONTINUE
638          IF(JL.EQ.0) GO TO 70
639 69      NEXT=LOC(JW,JL)
640          LOC(JW,JL)=ISET
641 70      IF(JW.EQ.0.OR.JL.EQ.0) JPCH(NRUN)=1
642 C
643 C-----
644 C
645 C * PUNCH-OUT OF DESCRIPTORS AND R-D PARAMETERS
646 C
647         IF(NEND.LT.10) PUNCH 500,SNO,WMTL,XMTL,BOOK,NPAGE,NTYPE,NDATE,
648         1KTEMP,KEDOT,SULT,ELONG,RA,RCH,EMOD,XN(J1),SY(J1),SEE(J1,3),
649         1NEXT,ISET
650         IF(NEND.EQ.10) PUNCH 501,SNO,WMTL,XMTL,BOOK,NPAGE,NTYPE,NDATE,
651         1KTEMP,KEDOT,SULT,ELONG,RA,RCH,EMOD,NEXT,ISET
652         IF(JPCH(NRUN).EQ.0) GO TO 1
653         KPCH=KPCH+1
654         WOUT(NRUN)=WMTL
655         XOUT(NRUN)=XMTL
656         ISOUT(NRUN)=ISET
657         GO TO 1
658 C
659 C-----
660 C
661 C * PUNCH OUT OF UPDATED LOCATER FILE
662 C
663 999     IF(NPUNCH.EQ.0) STOP
664         IF(NPRINT.EQ.0.AND.MOD(NPX,4).NE.0) PRINT 218
665         DO 71 JX=1,7
666             PUNCH 502,WA(JX),(LOC(JX,JK),JK=1,19)
667 71      CONTINUE
668         IF(KPCH.EQ.0) STOP
669 C
670 C-----
671 C
672 C * PRINT-OUT OF DIAGNOSTIC MESSAGE FOR DATA CODE NOT IN DATA BANK
673 C
674         PRINT 320
675         DO 72 NR=1,NPX
676             IF(JPCH(NR).EQ.0) GO TO 72
677             PRINT 321,ISOUT(NR),WOUT(NR),XOUT(NR)
678 72      CONTINUE
679         STOP
680 C

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681 C-----
682 C
683 C * READ-IN AND PRINT-OUT FORMAT STATEMENTS *
684 C
685 C-----
686 C
687 C * DATA READ-IN FORMAT STATEMENTS
688 C
689 100 FORMAT(3I2)
690 101 FORMAT(A6,2A2,3A4,I2,A5,I6,I5,2I2,F7.0,F6.4,F7.0,3F4.1,I4)
691 102 FORMAT(F7.0,F7.5)
692 C
693 C-----
694 C
695 C * FORMAT STATEMENTS FOR BEST-FIT PRINTOUT: NPRINT=0 OR 1
696 C
697 C * TEST DATA AND R-O PARAMETERS: FORMAT STATEMENTS 200 TO 207
698 C
699 200 FORMAT(1H1,T22,'RAMBERG-OSGOOD BEST FIT PARAMETERS * 0.2% OFFSET Y
700 1IELD AND EXPONENTS',/,T4,124(' '))
701 201 FORMAT(T12,'SPECIMEN NO: ',A6,2X,'MATERIAL: ',A2,'-',A2,
702 1'-',2A4,2X,'TEST TYPE: ',A5,2X,'DATE: ',I6,2X,'NTBK-PG: ',A4,
703 2'-',I2,2X,'SET NO: ',I4,/,T12,'TEMP=',I5,'C',2X,'EDOT=1.0',I2,
704 3' PER-SEC',2X,'S-ULT= ',F7.2,' KSI (',F7.1,' MPA)',2X,'ELONG= ',
705 4F4.1,'% ',2X,'RED-A= ',F4.1,'% ',2X,'R-CH= ',F4.1,/,)
706 202 FORMAT(T20,'UNITS : INCPT',2X,'MODULUS',4X,'SEE',4X,'C-CFT',2X,
707 1'PTS : ',1X,'EP-I',2X,'.2%-YLD',3X,'EXPNT',2X,'PTS : ',3X,'SPL',
708 23X,'.1%-YLD')
709 203 FORMAT(T20,'ENGL : ',1X,I5,2X,F6.2,3X,F5.2,2X,F7.4,2X,I3,1X,': ')
710 204 FORMAT(1H+,T20,46X,I4,2X,2(F7.2,1X),1X,I3,1X,': ',2(1X,F7.2))
711 205 FORMAT(T20,'METRC : ',8X,F6.1,3X,F5.1,15X,': ')
712 206 FORMAT(1H+,T20,52X,F7.1,14X,': ',2(1X,F7.1))
713 207 FORMAT(1H )
714 C
715 C-----
716 C
717 C * PI REPORT HEADING: NPRINT=1
718 C
719 208 FORMAT(1H1,T20,'**PRINCIPAL INVESTIGATOR REPORT ON STRESS-',
720 1'STRAIN TEST AND RAMBERG-OSGOOD ANALYSIS **',/,T10,'BEST-FIT ',
721 2'MODULUS, 0.2% OFFSET-YIELD, AND R-O EXPONENT CALCULATED BY ',
722 3'LEAST SQUARES. (SPEC AREA=',F6.4,' SQ-IN)',/,)
723 C
724 C-----
725 C
726 C * STATISTICS FORMAT STATEMENTS 210 TO 218
727 C
728 210 FORMAT(T16,4X,'SPL TO MPT',8X,'MPT TO SY',9X,'SPL TO SY',9X,'SPL
729 1TO SN',10X,'SY TO SN',/,T16,10X,5(2X,'SEE',3X,'C-CFT',1X,'PTS',1X)
730 2)
731 211 FORMAT(T16,'ENGL ',5X,3(F6.2,F7.4,1X,I3,1X))
732 212 FORMAT(1H+,T16,64X,F6.2,F7.4,1X,I3)
733 213 FORMAT(1H+,T16,64X,2(F6.2,F7.4,1X,I3,1X))
734 214 FORMAT(T16,'METRC',5X,3(F6.1,12X))
735 215 FORMAT(1H+,T16,64X,F6.1)
736 216 FORMAT(1H+,T16,64X,2(F6.1,12X))
737 217 FORMAT(T4,124(' '))
738 218 FORMAT(T10,'** UNITS: MODULUS IN M-PSI OR GPA * .2%-YLD, .1%-YLD,
739 1SPL & SEE IN KSI OR MPA * INCPT AND EP-I IN MICRO-IN/IN **')
740 C
741 C-----
742 C
743 C * DIAGNOSTIC MESSAGE PRINT-OUT FORMAT STATEMENTS 300 TO 321
744 C
745 300 FORMAT(////,T28,'*** DATA FOR THIS SPECIMEN COULD NOT BE ORDERED.
746 1ANALYSES WERE ABORTED.',////////,T4,124(' '))
747 C
748 C * STATEMENTS 301 TO 321 ARE PRINTED WHEN R-O EQUATION CANNOT BE SOLVED
749 C

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750 301  FORMAT(//,T24,'*** THEORETICAL STRESSES COULD NOT BE CALCULATED FO
751 1R ANY OF THE R-O PARAMETERS. ***',/,T24,'STATISTICAL EVALUATION WA
752 2S ABORTED AND NO BEST-FIT PARAMETERS COULD BE DETERMINED.',////,
753 3T4,124(' '))
754 302  FORMAT(T5,'S-ABORT: J=',I2,'-',I1,'-',I2)
755 303  FORMAT(1H+,T5,20X,'* J=',I2,'-',I1,'-',I2)
756 304  FORMAT(1H+,T5,32X,'* J=',I2,'-',I1,'-',I2)
757 305  FORMAT(1H+,T5,44X,'* J=',I2,'-',I1,'-',I2)
758 306  FORMAT(1H+,T5,56X,'* J=',I2,'-',I1,'-',I2)
759 307  FORMAT(1H+,T5,68X,'* J=',I2,'-',I1,'-',I2)
760 308  FORMAT(1H+,T5,80X,'* J=',I2,'-',I1,'-',I2)
761 309  FORMAT(1H+,T5,92X,'* J=',I2,'-',I1,'-',I2)
762 310  FORMAT(1H+,T5,104X,'* J=',I2,'-',I1,'-',I2)
763 C
764 C * STATEMENTS 315 TO 318 REFER TO NPRINT=2 OR 3 PRINT-OUT
765 C
766 315  FORMAT(T5,'SINCE ANALYSES WERE ABORTED, REQUESTED TABULAR DATA WER
767 1E NOT AVAILABLE AND COULD NOT BE PRINTED',/)
768 316  FORMAT(T25,I3,4X,I5,6X,'*ABORT* ANALYTIC STRESSES COULD NOT BE CAL
769 1CULATED * ABORT CODE=',I2)
770 317  FORMAT(T6,I3,I5,3X,'*ABORT* ANALYTIC STRESSES COULD NOT BE CALCULA
771 1TED * ABORT CODE=',I2)
772 318  FORMAT(T4,124(' '),/,T4,'ABORT MESSAGE: J VALUE-CODE-PT NO',
773 12X,'* ABORT CODE: 1= NO CONVERGENCE* 2= S TOO LARGE*',
774 2' 3= S TOO SMALL* 9= R-O EXPNT LESS THAN 1')
775 C
776 C * PI REPORT TABLE DIAGNOSTIC WHEN R-O ANALYSIS ABORT
777 C
778 319  FORMAT(1H0,T10,'SPEC NO: ',A6,2X,'*DIGITIZED STRESS AND STRAIN ',
779 1'VALUES AND THEORETICAL STRESS DEVIATIONS ',
780 2'FOR ELASTIC DATA',/,T10,'THEORETICAL DATA BEYOND THE PROP',
781 3'ORTIONAL LIMIT WERE NOT AVAILABLE',/)
782 C
783 C* DIAGNOSTIC WHEN TEST MATERIAL CODE NOT ASSIGNED IN DATA BANK
784 C
785 320  FORMAT(1H1,T30,36(' ',1X),/,T30,'MATERIAL AND/OR ALLOY CODES',1X,
786 1'HAVE NOT BEEN ASSIGNED IN THE DATA BANK',/,T30,'FOR THE TEST',1X,
787 2'SETS LISTED BELOW. AFTER CODES ARE ASSIGNED, NEXT VALUES',/,T30,
788 3'SHOULD BE ASSIGNED AND PUNCHED AND THE LOCATER FILE SHOULD BE',
789 4' UPDATED',/,T30,36(' ',1X),/,T31,'SET',,3X,'MATL',4X,'ALLOY',
790 5/,T31,'NUM',3X,2('CODE',4X),/)
791 321  FORMAT(T30,I4,4X,2(A2,6X))
792 C
793 C-----
794 C
795 C * ALL-TRIAL VALUE DATA AND TABLE PRINT-OUT STATEMENTS: NPRINT=2 OR 3
796 C * FORMAT STATEMENTS 400 TO 406 ARE FOR PARAMETERS * 409 TO 413 FOR STATISTICS
797 C
798 400  FORMAT(1H1,T42,'ANALYTIC APPROXIMATION OF STRESS-STRAIN PROPERTIES
799 1',/,T33,'RAMBERG-OSGOOD PARAMETERS OBTAINED FROM ANALYSES OF EXPER
800 2IMENTAL DATA',/)
801 401  FORMAT(T25,'VALUES OF 0.2-PCT OFFSET-YIELD AND R-O',
802 1' EXPONENT FROM LOG-LEAST SQUARES CALCULATIONS',/)
803 402  FORMAT(T50,'***** ELASTIC PROPERTIES *****',/,T10,'E=',F6.2,,1X,
804 1'MEGA-PSI',3X,'S-INT=',F6.0,' PSI',3X,'E-INT=',I5,' MU-IN/IN',3X,
805 2'SEE=',F6.2,' KSI',3X,'C-CFT=',F7.4,2X,'NO. DATA POINTS=',I3)
806 403  FORMAT(T10,'E=',F6.1,' GPA',8X,'S-INT=',F6.2,' MPA',26X,'SEE=',
807 1F6.1,' MPA',/)
808 404  FORMAT(T51,'***** PLASTIC PARAMETERS *****',/,
809 1T25,'ANAL INIT-EPS',4X,'R-O EXPNT',4X,
810 2'.2%-YIELD ',7X,'PROP-LIM',9X,'.1%-YIELD',5X,'ANAL',/,T25,
811 3'NO.',2X,'MU-STRAIN',7X,'N',5X,3(3X,'KSI',5X,'MPA',3X),1X,
812 4'PTS.',/)
813 405  FORMAT(T25,1X,I2,4X,I5,5X,F7.2,3X,3(F7.2,1X,F7.1,2X),1X,I3)
814 406  FORMAT(1H+,T23,'***',83X,'BEST-FIT')
815 C
816 409  FORMAT(1H0,T49,'***** STATISTICAL PARAMETERS *****',/,
817 1T5,18X,'SPL TO MPT',12X,'MPT TO SY',13X,'SPL TO SY',13X,
818 2'SPL TO SN',13X,'SY TO SN',/,T5,'ANAL INIT',3X,5(6X,'SEE',5X,'C-C'
819 3,2X,'NO '),/,T5,1X,'NO',3X,'EPS',3X,5(3X,'KSI',2X,'MPA',4X,'R',3X,

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820      4'PTS'),/)
821 410    FORMAT(T6,I2,1X,I5,3X,3(1X,F5.2,F5.1,F7.4,I3,1X))
822 411    FORMAT(1H+,T5,84X,'**INSUFFICIENT DATA BEYOND SY**')
823 412    FORMAT(1H+,T5,79X,F5.2,F5.1,F7.4,I3,3X,'*INSUFFICIENT DATA*')
824 413    FORMAT(1H+,T5,78X,2(1X,F5.2,F5.1,F7.4,I3,1X))
825 C
826 C-----
827 C
828 C * NPRINT=3 OPTIONAL TABLES: FORMAT STATEMENTS 414 TO 425
829 C
830 414    FORMAT(1H1,T7,'SPEC. ',A6,2X,'POINT-BY-POINT DEVIATIONS OF CALCULA
831      1TED STRESSES FROM OBSERVED VALUES USING THE PARAMETERS FOR')
832 415    FORMAT(1H+,T7,110X,'J=1 TO J=5',/)
833 416    FORMAT(1H+,T7,110X,'J=6 TO J=10',/)
834 417    FORMAT(T12,5X,'ADJ',6X,'OBS',2X,'PLASTIC',
835      15(1X,I4,1X,'MU-EPS-I',1X),/,T11,
836      2'PT',3X,'STRAIN',2X,'STRESS',1X,'STRAIN',1X,
837      35(2X,'STRESS',3X,'DEV',1X),/T11,
838      4'NO',3X,'IN/IN',5X,'KSI',2X,'MU-EPS',1X,
839      55(4X,'KSI',4X,'PCT',1X),/)
840 418    FORMAT(T10,I3,2X,F7.6,1X,F7.2,2X,I4,2X,5(1X,F7.2,1X,F5.1,1X))
841 419    FORMAT(T10,I3,2X,F7.6,1X,F7.2,2X,I4)
842 420    FORMAT(1H+,T12,27X,F7.2,1X,F5.1)
843 421    FORMAT(1H+,T12,42X,F7.2,1X,F5.1)
844 422    FORMAT(1H+,T12,57X,F7.2,1X,F5.1)
845 423    FORMAT(1H+,T12,72X,F7.2,1X,F5.1)
846 424    FORMAT(1H+,T12,87X,F7.2,1X,F5.1)
847 425    FORMAT(1H0,T4,124('-'),/,T12,'** BLANK COLUMNS ARE FOR CASES WHERE
848      1 ANALYTIC STRESSES COULD NOT BE CALCULATED. SEE DATA COMPILATION F
849      2OR REASONS',/,T4,124('-'))
850 C
851 C-----
852 C
853 C * PI REPORT (NPRINT=1) TABLE: FORMAT STATEMENTS 426 TO 433
854 C
855 426    FORMAT(1H0,T15,'SPEC NO: ',A6,2X,'*DIGITIZED STRESS AND STRAIN ',
856      1'VALUES AND THEORETICAL STRESS AND STRESS DEVIATIONS*',
857      2/,T10,'ANALYTIC DATA CALCULATED USING BEST-FIT RAMBERG-OSGOOD ',
858      3'PARAMETERS: SY=',F7.2,' KSI, N=',F7.2,' & E=',F6.2,' M-PSI',/)
859 427    FORMAT(T10,14X,'ADJ',4X,'PLASTIC',4X,'OBS',5X,'CALC',/,T10,'PT',3X,
860      1'LOAD',4X,2('STRAIN',2X),1X,2('STRESS',3X),1X,'DEV',/,T10,'NO',
861      23X,'LBS',5X,'IN/IN',3X,'MU-EPS',5X,'KSI',6X,'KSI',5X,'PCT',/)
862 428    FORMAT(T10,I2,1X,F7.0,2X,F7.5,2X,I5,3X,2(F7.2,2X),F5.1)
863 429    FORMAT(T10,I2,1X,F7.0,2X,F7.5,2X,I5,3X,F7.2)
864 430    FORMAT(T10,2(14X,'ADJ',4X,'PLASTIC',4X,'OBS',5X,'CALC',16X),/,T10,
865      12('PT',3X,'LOAD',4X,2('STRAIN',2X),1X,2('STRESS',3X),1X,'DEV',8X)
866      2/,T10,2('NO',3X,'LBS',5X,'IN/IN',3X,'MU-EPS',5X,'KSI',6X,'KSI',
867      35X,'PCT',8X),/)
868 431    FORMAT(T10,2(I2,1X,F7.0,2X,F7.5,2X,I5,3X,2(F7.2,2X),F5.1,8X))
869 432    FORMAT(T10,2(I2,1X,F7.0,2X,F7.5,2X,I5,3X,F7.2,24X))
870 433    FORMAT(T10,I2,1X,F7.0,2X,F7.5,2X,I5,3X,2(F7.2,2X),F5.1,8X,I2,1X,
871      1F7.0,2X,F7.5,2X,I5,3X,F7.2)
872 434    FORMAT(T4,124('-'),/,T10,'THERE WERE ',I2,' INPUT DATA POINTS. ')
873 435    FORMAT(1H+,T10,33X,'STRESS CALCULATIONS WERE MADE ONLY ',
874      1'FOR DATA WHOSE TOTAL STRAIN WAS LESS THAN .02-IN/IN')
875 436    FORMAT(T4,124('-'),/,T10,'STRESS CALCULATIONS WERE MADE ONLY ',
876      1'FOR DATA WHOSE TOTAL STRAIN WAS LESS THAN .02-IN/IN')
877 C
878 C-----
879 C
880 C * PUNCH-OUT FORMAT STATEMENTS
881 C
882 500    FORMAT(A6,2A2,A4,I2,I1,I6,I5,I2,F6.1,3F4.1,F6.2,2F7.2,F4.1,2I4)
883 501    FORMAT(A6,2A2,A4,I2,I1,A6,I5,I2,F7.2,3F4.1,F6.2,18X,2I4)
884 502    FORMAT(A2,19I4)
885 C
886 C-----
887 C
888      END

```

```

1 C-----
2 SUBROUTINE ORDER(N,S,E,P,MORDER)
3 C-----
4 C
5 C * SUBROUTINE ARRANGES INPUT DATA IN ORDER OF INCREASING STRAIN MAGNITUDE
6 C * USED ONLY IF CHECK IN MAIN PROGRAM SHOWS INPUT DATA NOT IN ORDER
7 C
8 C-----
9 C
10 DIMENSION S(1),E(1),P(1)
11 KOUNT=0
12 M=N-1
13 1 NOUT=0
14 DO 2 I=1,M
15 IF(E(I).LE.E(I+1)) GO TO 2
16 NOUT=NOUT+1
17 SA=S(I)
18 EA=E(I)
19 PA=P(I)
20 SB=S(I+1)
21 EB=E(I+1)
22 PB=P(I+1)
23 S(I)=SB
24 E(I)=EB
25 P(I)=PB
26 S(I+1)=SA
27 E(I+1)=EA
28 P(I+1)=PA
29 2 CONTINUE
30 KOUNT=KOUNT+1
31 IF(KOUNT.LT.N) GO TO 3
32 MORDER=1
33 RETURN
34 3 IF(NOUT.GT.0) GO TO 1
35 RETURN
36 C
37 END

```

```

1 C-----
2 SUBROUTINE LSTSQ(X,Y,SL,OF,LI,LJ)
3 C-----
4 C
5 C * SUBROUTINE PERFORMS A LINEAR REGRESSION ANALYSIS (LEAST SQUARES)
6 C * FOR MODULUS AND INTERCEPT: X=STRAIN Y=STRESS
7 C * FOR RAMBERG-OSGOOD PARAMETERS: X=LOG PLASTIC-STRAIN Y=LOG STRESS
8 C
9 C-----
10 C
11 DIMENSION X(1),Y(1)
12 ET=0
13 ST=0
14 EET=0
15 EST=0
16 DO 1 I=LI,LJ
17 ET=ET+X(I)
18 ST=ST+Y(I)
19 EET=EET+X(I)**2
20 1 EST=EST+X(I)*Y(I)
21 NC=LJ-LI+1
22 DEN=NC*EET-ET**2
23 ENUM=NC*EST-ET*ST
24 ONUM=ST*EET-ET*EST
25 SL=ENUM/DEN
26 OF=ONUM/DEN
27 RETURN
28 C
29 END

```

```

1 C-----
2     SUBROUTINE RJA75(Z,XP,BB,AA,ITER)
3 C-----
4 C
5 C * SUBROUTINE CALCULATES NON-D R-O STRESS FOR A GIVEN VALUE OF STRAIN *
6 C * NUMERICAL SOLUTION OF FUNC(Z) WHERE Z=S/SY
7 C
8 C * IF NO SOLUTION IN 100 ITERATIONS, CALCULATIONS ABORTED: ITER=100
9 C
10 C-----
11 C
12     FUNC(Z)=Z+AA*Z**XP-BB
13     ITER=1
14     IF(XP.LT.1.) GO TO 6
15     RM=1.E-5
16     DZ=.1
17     RZ=FUNC(Z)
18     IF(RZ.GT.0..AND.XP.GE.200.) DZ=.01
19     IF(RZ.LT.0..AND.XP.GE.5000.) GO TO 6
20     IF(RZ.LT.0..AND.XP.LT.5000..AND.XP.GE.1000.) DZ=.0001
21     IF(RZ.LT.0..AND.XP.LT.1000..AND.XP.GE.500.) DZ=.001
22     IF(RZ.LT.0..AND.XP.LT.500..AND.XP.GE.100.) DZ=.01
23 1   IF(ABS(RZ).LE.RM) GO TO 6
24     ITER=ITER+1
25     IF(ITER.EQ.100) GO TO 6
26     IF(RZ.LT.0.)GO TO 3
27     IF(Z.LE..01) GO TO 8
28     IF(Z.LE..1.AND.Z.GT.0.) GO TO 2
29     Z=Z-DZ
30     IF(Z.LE..01) GO TO 8
31     TEST=XP*ALOG10(Z)
32     IF(TEST.LE.-20.) GO TO 9
33     IF(TEST.GE.20.) GO TO 7
34     RZ=FUNC(Z)
35     GO TO 1
36 2   DZ=.1*DZ
37     Z=Z-DZ
38     RZ=FUNC(Z)
39     GO TO 1
40 3   V=Z+DZ
41     TEST=XP*ALOG10(V)
42     IF(TEST.LE.-20.) GO TO 9
43     IF(TEST.GE.20.) GO TO 7
44     RV=FUNC(V)
45     IF(ABS(RV).LE.RM) GO TO 5
46     ITER=ITER+1
47     IF(ITER.EQ.100) GO TO 6
48     IF(RV.LT.0.) GO TO 4
49     DZ=.1*DZ
50     IF(V.GE.1..AND.DZ.LT.RM) GO TO 5
51     GO TO 3
52 4   Z=Z+DZ
53     GO TO 3
54 5   Z=V
55 6   RETURN
56 7   ITER=200
57     RETURN
58 8   ITER=300
59     RETURN
60 9   Z=BB
61     RETURN
62 C
63 C-----
64 C
65 C * ITER=200 * ABORT: Z-VALUE INCREASING AND FUNC(Z) DIVERGING
66 C * TESTED IN LINES 33 AND 43
67 C
68 C * ITER=300 * ABORT: Z-VALUE BECOMING VANISHINGLY SMALL
69 C * TESTED IN LINES 27 AND 30
70 C
71 C-----
72 C
73     END

```



```
1 @ASG,A R*EVALRO.  
2 @ASG,A R*LOCATER.  
3 @USE 10,R*LOCATER.  
4 @XQT R*EVALRO.FITDATA
```

```
1 @PREP R*EVALRO.  
2 @MAP,I CIS,R*EVALRO.FITDATA  
3 IN R*EVALRO.MAIN  
4 LIB R*EVALRO.  
5 END  
6 @PACK R*EVALRO.  
7 @PRT,TL R*EVALRO.
```

LISTING OF R*RETRIEVE

The RETRIEVE file consists of the following file elements. Unless otherwise noted, the subroutines are used with both main programs.

Element	Function
PMAIN	Main program for data retrieval of stored data on teletype terminals
TMAIN	Main program for data retrieval of stored data on cathode-ray-tube graphics terminals
TYCODE	Subroutine of PMAIN for displaying material and alloy code tables and for input of users material/alloy selection
CODE	Subroutine of TMAIN with same function as TYCODE
RANGE	Finds and prints extreme values of selected retrieval option parameter in the available data for the selected material/alloy
COUNT	Counts and prints the number of data sets whose value of the selected retrieval option parameter is within the user-specified limits
LONG	Subroutine of TMAIN which retrieves desired data from data file and prints a long form list
LPRT	Subroutine of PMAIN with same function as LONG for 132-character line-length teletype terminals
SHORT	Subroutine of TMAIN which retrieves desired data from data file and prints a short form list
SPRT	Subroutine of PMAIN with same function as SHORT for 132-character line-length teletype terminals
PORPRT	Subroutine of PMAIN which retrieves desired data from data file and prints an expanded short form list on 80-character line-length teletype terminals
SYSIZE	Subroutine of TMAIN examines yield stress data for sets selected for graphical display and determines which of the sets has the highest yield stress value
CALC	Subroutine of TMAIN which calculates the plotting points for a graphical stress-strain curve display
BUFFPK	Used in forming the absolute of TMAIN with the same function as in PICPTS (see page 2).

There are four elements used for control functions whose listings are also given. These are:

Control Element	Function
TELTYP	Assigns DATABANK and LOCATER files to the run and executes PMAIN
CRTUBE	Assigns DATABANK and LOCATER files to the run and executes TMAIN
MAPTYP	After edit of PMAIN, used to PREP file and to form the absolute (name: TYP)
MAPCRT	After edit of TMAIN, used to PREP file and to form the absolute (name: CRT).

Element TMAIN uses the following TEKTRONIX PLOT-10 subroutines: INITT, CHRISZ, ANMODE, NEWPAG, IOWAIT, BINITT, NPTS, CHECK, DSPLAY, LINE, SYMBL, SIZES, CPLOT, MOVABS, and FINITT. No listings have been given for these subroutines. The PLOT-10 subroutines are referenced from the file DAO*TEX and from the BUFFPK package when the absolute for TMAIN is created.

RETRIEVE may be executed interactively on any of three types of terminals: TEKTRONIX 4014 graphics terminals, 132-character carriage-length teletype terminals, or 80-character carriage-length teletype terminals. Data are retrieved by the program from the R*DATABANK file in the computer using the R*LOCATER file as described in Reference 2.

Listings of the two main programs and the subroutines are given on pages 29-53. The four control elements are listed, in the order given above, on page 54.

```

1 C -----
2 C * FILE R*RETRIEVE IS FOR RETRIEVING DATA FROM DATABANK
3 C * THIS IS THE ELEMENT PMAIN (ABSOLUTE: TYP)
4 C -----
5 C
6 C * THIS ELEMENT IS FOR KEYBOARD PRINT TERMINALS
7 C * 132-CHARACTER LINE-LENGTH TERMINALS HERE CALLED TELETYPE
8 C * 80-CHARACTER LINE-LENGTH TERMINALS HERE CALLED PORTABLE
9 C * ANALYZED STRESS-STRAIN DATA LISTED FOR REQUESTED MATERIAL/ALLOY
10 C * THIS IS AN INTERACTIVE PROGRAM REQUIRING RESPONSES FROM USER
11 C
12 C * PROGRAM EXECUTED WITH @ADD R*RETRIEVE.TELTYP
13 C * FILE 20 IS DATABANK
14 C
15     DEFINE FILE 20(9999,80,E,II)
16 C
17 C -----
18 C
19 C * IDENTIFY TYPE AND PREPARE TERMINAL: EXPAND BUFFER TO FULL CAPACITY
20 C
21     1    WRITE(6,300)
22         READ(5,201),TERM
23         IF(TERM.EQ.'TEL') WRITE(6,301)
24         IF(TERM.EQ.'POR') WRITE(6,302)
25         IF(TERM.EQ.'TEL'.OR.TERM.EQ.'POR') GO TO 10
26         WRITE(6,102)
27         READ(5,201),ANS
28         IF(ANS.EQ.'YES') GO TO 1
29         GO TO 50
30     10   READ(5,200)
31 C
32 C -----
33 C
34 C * READ-IN OF MATERIAL/ALLOY CODE OF DATA TO BE LISTED
35 C
36     11   CALL TYCODE(JEND,NI,W,X)
37 C
38 C -----
39 C FOUR OPTIONS OF SELECIVE OF DATA RETRIEVAL FOR CHOSEN MATL/ALLOY
40 C IDENT=0: ALL DATA SETS
41 C IDENT=1: ONLY DATA WHOSE ULTIMATE STRENGTH IS WITHIN A SELECTED RANGE
42 C IDENT=2: ONLY DATA WHOSE YIELD STRENGTH IS WITHIN A SELECTED RANGE
43 C IDENT=3: ONLY DATA WHOSE ROCKWELL-C HARDNESS IS WITHIN A SELECTED RANGE
44 C
45 C * TWO TELETYPE PRINT-OUT OPTIONS: LONG-FORM OR SHORT-FORM
46 C * ONLY EXPANDED SHORT-FORM PRINT-OUT AVAILABLE FOR PORTABLE TERMINALS
47 C
48     IF(JEND.EQ.0) GO TO 50
49     IHOLD=NI
50 C
51 C -----
52 C
53 C * IDENTIFICATION OF SELECTIVE RETRIEVAL OPTION
54 C
55     12   IDENT=0
56         XMAX=0
57         XMIN=0
58         WRITE(6,101)
59         READ(5,201),ANS
60         IF(ANS.EQ.'ALL') GO TO 18
61         IF(ANS.EQ.'ULT') IDENT=1
62         IF(ANS.EQ.'YIE') IDENT=2
63         IF(ANS.EQ.'HAR') IDENT=3
64         IF(IDENT.GT.0) GO TO 13
65         WRITE(6,102)
66         READ(5,201),ANS
67         IF(ANS.NE.'YES') GO TO 50
68         GO TO 12

```



```

69 C
70 C-----
71 C
72 C ENTRY OF PARAMETER VALUE AND RANGE
73 C SUBROUTINE RANGE FINDS AND PRINTS EXTREMES OF PARAMETER VALUES
74 C
75 13 CALL RANGE(W,X,NI,IDENT,JEND)
76 NI=IHOLD
77 IF(JEND.EQ.0) GO TO 50
78 IF(IDENT.EQ.0) GO TO 18
79 14 WRITE(6,103)
80 READ(5,200,ERR=30),XMIN,XMAX
81 IF(XMAX.GT.XMIN) GO TO 15
82 YMIN=XMAX
83 YMAX=XMIN
84 XMAX=YMAX
85 XMIN=YMIN
86 15 READ(20'NI,202),NTYPE,SULT,RCH,SY,NEXT
87 IF(NTYPE.NE.1) GO TO 16
88 IF(IDENT.EQ.1.AND.SULT.LE.XMAX.AND.SULT.GE.XMIN) GO TO 18
89 IF(IDENT.EQ.2.AND.SY.LE.XMAX.AND.SY.GE.XMIN) GO TO 18
90 IF(IDENT.EQ.3.AND.RCH.LE.XMAX.AND.RCH.GE.XMIN) GO TO 18
91 16 IF(NEXT.EQ.0) GO TO 17
92 NI=NEXT
93 GO TO 15
94 C
95 C-----
96 C
97 C * CORRECTION OPTIONS WHEN NO DATA IN DESIRED RANGE OF SELECTED PARAMETER
98 C
99 17 NI=IHOLD
100 WRITE(6,105)
101 READ(5,201),ANS
102 IF(ANS.EQ.'RAN') GO TO 14
103 IF(ANS.EQ.'OPT') GO TO 12
104 IF(ANS.EQ.'NEW') GO TO 11
105 IDENT=0
106 IF(ANS.EQ.'ALL') GO TO 18
107 GO TO 50
108 C
109 C-----
110 C
111 C * PRINT-OUT OPTIONS: LONG-FORM OR SHORT-FORM FOR STANDARD TELETYPE
112 C * ONLY EXPANDED SHORT-FORM AVAILABLE FOR PORTABLE TERMINAL
113 C
114 18 NI=IHOLD
115 IF(IDENT.GT.0) CALL COUNT(IDENT,NI,XMIN,XMAX)
116 19 IF(TERM.EQ.'POR') WRITE(6,104)
117 IF(TERM.NE.'POR') WRITE(6,106)
118 READ(5,201),ANS
119 IF(ANS.EQ.'SHO') GO TO 20
120 IF(ANS.EQ.'LON') GO TO 21
121 IF(ANS.EQ.'PRI') GO TO 22
122 IF(ANS.EQ.'CHA') GO TO 12
123 IF(ANS.EQ.'END') GO TO 50
124 WRITE(6,107)
125 GO TO 19
126 C
127 C-----
128 C
129 C * PRINT-OUT OF LISTING
130 C
131 20 CALL SPRT(W,X,NI,IDENT,XMIN,XMAX)
132 GO TO 40
133 21 CALL LPRT(W,X,NI,IDENT,XMIN,XMAX)
134 GO TO 40
135 22 CALL PORPRT(W,X,NI,IDENT,XMIN,XMAX)
136 GO TO 40

```

```

137 C
138 C-----
139 C
140 C * ERROR DIAGNOSTIC AND OPTION TO CORRECT WHEN MIN-MAX ENTRY ERROR
141 C
142 30 WRITE(6,107)
143 WRITE(6,400)
144 READ(5,201),ANS
145 IF(ANS.EQ.'YES') GO TO 14
146 GO TO 50
147 C
148 C-----
149 C
150 C * OPTIONS: NEW LISTING OR TERMINATE
151 C
152 40 WRITE(6,108)
153 READ(5,201),ANS
154 IF(ANS.EQ.'NEW') GO TO 11
155 C
156 C-----
157 C
158 C * TERMINATION
159 C
160 50 WRITE(6,109)
161 51 STOP
162 C
163 C-----
164 C
165 101 FORMAT(T2,'TABLE BELOW LISTS RETRIEVAL OPTIONS AND ENTRIES',//,
166 1T2,'RETRIEVAL OPTION',14X,'ENTRY',/,T2,35('-'),/,
167 2T2,'ALL DATA FOR SELECTED MATL',4X,'ALL',/,
168 3T2,'DATA FOR SPECIFIC UTS RANGE',3X,'ULTIMATE',/,
169 4T2,'DATA FOR SPECIFIC SY RANGE',4X,'YIELD',/,
170 5T2,'DATA FOR SPECIFIC RCH RANGE',3X,'HARDNESS',/,
171 6T2,'MAKE YOUR ENTRY NOW',/)
172 102 FORMAT(T2,'ENTRY DID NOT CORRESPOND TO EITHER OF THE ABOVE',/,
173 1T2,'IF YOU WISH TO CORRECT, ENTER YES',/,
174 2T2,'OTHERWISE ENTER END AND RUN WILL TERMINATE')
175 103 FORMAT(/,T2,'DATA WILL BE RETRIEVED FOR A RANGE OF VALUES OF ',
176 1'THE CHOSEN PARAMETER',//,T2,'NEXT ENTRY DEFINES LOWER AND ',
177 2'UPPER BOUNDS OF DESIRED RANGE',
178 3//,T2,'ENTRY UNITS: KSI UNITS FOR STRENGTH AND ',
179 4'ROCKWELL-C FOR HARDNESS',/,T2,'SEPARATE THE TWO VALUES BY A ',
180 5'COMMA. EXAMPLE: 150.,155.',//,T2,'ENTER BOUND VALUES NOW')
181 104 FORMAT(/,T2,'PRINT NOW, CHANGE RETRIEVAL OPTION, OR TERMINATE',
182 1/,T2,48('-'),/,T2,'1. TO PRINT A DATA-LIST ENTER: PRINT',/,T2,
183 2'2. TO CHANGE RETRIEVAL OPTION ENTER: CHANGE',/,T2,
184 3'3. TO TERMINATE THE PROGRAM ENTER: END',/,T2,
185 4'MAKE YOUR ENTRY NOW')
186 105 FORMAT(T2,'THERE ARE NO DATA IN THE DATA BANK FOR THE',/,T2,,
187 1'SPECIFIED RANGE OF THE SELECTED PARAMETER',/,T2,
188 3'TO CHANGE THE RANGE LIMITS, ENTER: RANGE',/,
189 4T2,'TO LIST ALL THE DATA FOR THE MATERIAL, ENTER: ALL',/,
190 5T2,'TO CHOOSE ANOTHER OPTION, ENTER: OPTION',/,
191 6T2,'TO CHOOSE ANOTHER MATERIAL, ENTER NEW',/,
192 7T2,'OTHERWISE ENTER END AND RUN WILL TERMINATE')
193 106 FORMAT(T2,'PRINT NOW, CHANGE RETRIEVAL OPTION, OR TERMINATE',/,T2,
194 148('-'),/,T2,'1. TO PRINT A LONG-FORM DATA-LIST ENTER: LONG',
195 2/,T2,'2. TO PRINT A SHORT-FORM DATA-LIST ENTER: SHORT',/,T2,
196 3'3. TO CHANGE RETRIEVAL OPTION ENTER: CHANGE',/,T2,
197 4'4. TO TERMINATE THE PROGRAM ENTER: END',/,T2,
198 5'MAKE YOUR ENTRY NOW')
199 107 FORMAT(/,T2,'** ERROR: ENTRY NOT RECOGNIZED **')
200 108 FORMAT(T2,2X,'OPTIONS: MAKE ONE OF TWO ENTRIES',/,T2,2X,31('-'),
201 1/,T2,'FOR A DATA LIST OF ANOTHER MATERIAL ENTER: NEW',/,T2,
202 2'TO TERMINATE THE PROGRAM ENTER: END')
203 109 FORMAT(T2,'RUN IS OVER. WHEN NEXT PROMPT (>) APPEARS ENTER @FIN')
204 C

```

```

205 200  FORMAT( )
206 201  FORMAT(A3)
207 202  FORMAT(16X,I1,13X,F6.1,8X,F4.1,13X,F7.2,4X,I4)
208 C
209 300  FORMAT(T2,'THIS PROGRAM CAN BE RUN ONLY ON HARD-PRINT TERMINALS',
210      2/,T2,'IDENTIFY THE TERMINAL YOU USING:',/,T2,
211      3'IF ON A 132-CHARACTER TERMINAL ENTER: TELETYPE',/,T2,
212      4'IF ON AN 80-CHARACTER TERMINAL ENTER: PORTABLE',/,T2,
213      5'MAKE ENTRY NOW AND KEY RETURN')
214 301  FORMAT(T2,1X,'PREPARE TERMINAL FOR DATA RETRIEVAL:',/,/,T2,
215      1'1. ENTER: @TTY W,132 THEN KEY RETURN',/,T2,
216      2'2. WAIT FOR RESPONSE FROM COMPUTER: -@@COMPLETE',/,T2,
217      3'3. THEN WHEN PROMPT APPEARS KEY RETURN')
218 302  FORMAT(T2,1X,'PREPARE TERMINAL FOR DATA RETRIEVAL:',/,/,T2,
219      1'1. ENTER: @TTY W,80 THEN KEY RETURN',/,T2,
220      2'2. WAIT FOR RESPONSE FROM COMPUTER: -@@COMPLETE',/,T2,
221      3'3. THEN WHEN PROMPT APPEARS KEY RETURN')
222 C
223 400  FORMAT(T2,'IF YOU WISH TO CORRECT, ENTER YES',/,
224      1T2,'OTHERWISE ENTER END AND RUN WILL TERMINATE')
225 C
226      END

```

```

1 C-----
2 C * FILE R*RETRIEVE IS FOR RETRIEVING DATA FROM DATABANK
3 C * ELEMENT TMAIN (ABSOLUTE: CRT) FOR TEKTRONIX GRAPHICS TERMINAL
4 C-----
5 C
6 C * ANALYZED STRESS-STRAIN DATA LISTED FOR REQUESTED MATERIAL/ALLOY
7 C * OPTIONAL GRAPHICS ROUTINE PLOTS STRESS-STRAIN CURVE FOR ANY SET
8 C * THIS IS AN INTERACTIVE PROGRAM REQUIRING RESPONSES FROM USER
9 C
10 C * PROGRAM EXECUTED WITH @ADD R*RETRIEVE.CRTUBE
11 C
12     DIMENSION LOC(19),S(64),E(64),EP(64),SS(3),EE(3)
13 C
14 C-----
15 C
16 C * FILE 10 IS LOCATER AND FILE 20 IS DATABANK
17 C
18     DEFINE FILE 10(50,80,E,JJ)
19     DEFINE FILE 20(9999,80,E,II)
20 C
21 C-----
22 C
23 C * PREPARE TERMINAL: EXPAND BUFFER TO 132 CHARACTERS
24 C
25     CALL INITT(30)
26     CALL TERM(2,1024)
27     CALL CHRSLZ(4)
28     CALL ANMODE
29     KURVE=0
30     WRITE(6,100)
31     READ(5,200)
32 C
33 C-----
34 C
35 C * READ-IN OF MATERIAL/ALLOY CODE OF DATA TO BE LISTED
36 C
37     1  CALL NEWPAG
38         CALL IOWAIT(20)
39         CALL CODE(LOC,JEND,NI,W,X)
40 C
41 C-----
42 C * FOUR OPTIONS OF SELECIVE OF DATA RETRIEVAL FOR CHOSEN MATL/ALLOY

```

```

43 C * IDENT=0: ALL DATA SETS
44 C * IDENT=1: ONLY DATA WHOSE ULTIMATE STRENGTH IS WITHIN A SELECTED RANGE
45 C * IDENT=2: ONLY DATA WHOSE YIELD STRENGTH IS WITHIN A SELECTED RANGE
46 C * IDENT=3: ONLY DATA WHOSE ROCKWELL-C HARDNESS IS WITHIN A SELECTED RANGE
47 C
48 C * TWO PRINT-OUT OPTIONS: LONG-FORM PRINT-OUT OR SHORT-FORM PRINT-OUT
49 C
50     IF(JEND.EQ.0) GO TO 50
51     IHOLD=NI
52 C
53 C-----
54 C
55 C * IDENTIFICATION OF SELECTIVE RETRIEVAL OPTION
56 C
57     2   IDENT=0
58         XMAX=0
59         XMIN=0
60         WRITE(6,101)
61         READ(5,201),ANS
62         IF(ANS.EQ.'ALL') GO TO 8
63         IF(ANS.EQ.'ULT') IDENT=1
64         IF(ANS.EQ.'YIE') IDENT=2
65         IF(ANS.EQ.'HAR') IDENT=3
66         IF(IDENT.GT.0) GO TO 3
67         WRITE(6,102)
68         READ(5,201),ANS
69         IF(ANS.NE.'YES') GO TO 50
70         GO TO 2
71 C
72 C-----
73 C
74 C * ENTRY OF PARAMETER VALUE AND RANGE
75 C * SUBROUTINE RANGE FINDS AND PRINTS EXTREMES OF PARAMETER VALUES
76 C
77     3   CALL RANGE(W,X,NI,IDENT,JEND)
78         NI=IHOLD
79         IF(JEND.EQ.0) GO TO 50
80         IF(IDENT.EQ.0) GO TO 8
81     4   WRITE(6,103)
82         MX=1
83         READ(5,200,ERR=45),XMIN,XMAX
84         IF(XMAX.GT.XMIN) GO TO 5
85         YMIN=XMAX
86         YMAX=XMIN
87         XMAX=YMAX
88         XMIN=YMIN
89     5   READ(20'NI,202),NTYPE,SULT,RCH,SY,NEXT
90         IF(NTYPE.NE.1) GO TO 6
91         IF(IDENT.EQ.1.AND.SULT.LE.XMAX.AND.SULT.GE.XMIN) GO TO 8
92         IF(IDENT.EQ.2.AND.SY.LE.XMAX.AND.SY.GE.XMIN) GO TO 8
93         IF(IDENT.EQ.3.AND.RCH.LE.XMAX.AND.RCH.GE.XMIN) GO TO 8
94     6   IF(NEXT.EQ.0) GO TO 7
95         NI=NEXT
96         GO TO 5
97 C
98 C-----
99 C
100 C * CORRECTION OPTIONS WHEN NO DATA IN DESIRED RANGE OF SELECTED PARAMETER
101 C
102     7   NI=IHOLD
103         WRITE(6,105)
104         READ(5,201),ANS
105         IF(ANS.EQ.'RAN') GO TO 4
106         IF(ANS.EQ.'OPT') GO TO 2
107         IF(ANS.EQ.'NEW') GO TO 1
108         IDENT=0
109         IF(ANS.EQ.'ALL') GO TO 8
110         GO TO 50

```



```

111 C
112 C-----
113 C
114 C * PRINT-OUT OPTIONS: LONG-FORM OR SHORT-FORM
115 C
116 8 NI=IHOLD
117 IF(IDENT.GT.C) CALL COUNT(IDENT,NI,XMIN,XMAX)
118 9 WRITE(6,106)
119 READ(5,201),ANS
120 IF(ANS.EQ.'SHO') GO TO 10
121 IF(ANS.EQ.'LON') GO TO 11
122 IF(ANS.EQ.'CHA') GO TO 2
123 IF(ANS.EQ.'END') GO TO 50
124 WRITE(6,107)
125 GO TO 9
126 C
127 C * PRINT-OUT OF LISTING
128 C
129 10 CALL SHORT(W,X,NI,IDENT,XMIN,XMAX)
130 GO TO 20
131 11 CALL LONG(W,X,NI,IDENT,XMIN,XMAX)
132 C-----
133 C
134 C * OPTIONS: NEW LISTING * PLOT OF S-E CURVE * TERMINATE
135 C
136 20 CALL NEWPAG
137 CALL IOWAIT(20)
138 WRITE(6,118)
139 READ(5,201),ANS
140 IF(ANS.EQ.'NEW') GO TO 1
141 IF(ANS.EQ.'CUR') GO TO 30
142 GO TO 50
143 C
144 C-----
145 C
146 C * GRAPHIC DISPLAY OF STRESS STRAIN CURVE
147 C
148 C * PREPARATION OF TERMINAL FOR PLOTTING: REDUCE BUFFER TO 72 CHARACTERS
149 C
150 C * ASSIGNMENT OF PLASTIC STRAIN VALUES USED IN COMPUTATIONS
151 C * STATEMENTS 30 TO 33 DONE ONCE IN RUN (KURVE=0)
152 C
153 30 WRITE(6,119)
154 READ(5,201),ANS
155 IF(KURVE.GT.0) GO TO 34
156 KURVE=KURVE+1
157 NC=64
158 EP(1)=0
159 EP(2)=1.E-5
160 DO 31 I=3,NC
161 IF(I.LE.5) EP(I)=(I-2)*5.E-5
162 IF(I.GT.5) EP(I)=2.E-4+(I-6)*1.E-4
163 31 CONTINUE
164 C
165 C-----
166 C
167 C * IDENTIFICATION OF CURRENT END-OF-FILE SET NUMBER OF DATABANK
168 C
169 IEND=0
170 DO 33 J=1,7
171 READ(10'J,203),AA,(LOC(L),L=1,19)
172 DO 32 L=1,19
173 IF(LOC(L).LT.IEND) GO TO 32
174 IEND=LOC(L)
175 32 CONTINUE
176 33 CONTINUE
177 C
178 C-----

```

```

179 C
180 C * READ-IN OF SETS TO BE GRAPHED AND CHECK THAT SET NOS. NOT BEYOND EOF
181 C * THREE CURVES ON ONE GRAPH PERMITTED
182 C
183 34 WRITE(6,120)
184 MX=2
185 READ(5,200,ERR=45),IANS
186 IF(IANS.GT.0.AND.IANS.LE.3) GO TO 35
187 WRITE(6,121)
188 READ(5,201),ANS
189 IF(ANS.EQ.'YES') GO TO 34
190 GO TO 51
191 35 ISET1=0
192 ISET2=0
193 ISET3=0
194 WRITE(6,122)
195 MX=3
196 IF(IANS.EQ.1) READ(5,200,ERR=45),ISET1
197 IF(IANS.EQ.2) READ(5,200,ERR=45),ISET1,ISET2
198 IF(IANS.EQ.3) READ(5,200,ERR=45),ISET1,ISET2,ISET3
199 IF(IEND.GE.ISET1.AND.IEND.GE.ISET2.AND.IEND.GE.ISET3) GO TO 36
200 WRITE(6,123),IEND
201 READ(5,201),ANS
202 IF(ANS.EQ.'YES') GO TO 34
203 GO TO 51
204 C
205 -----
206 C
207 C * COMPUTATIONS AND DISPLAY OF CURVE NUMBER 1
208 C * CURVE NUMBER 1 IS ALWAYS THE DATA-SET WITH MAXIMUM YIELD STRESS
209 C * SUBROUTINE SYSIZE ASSIGNS ISET1 TO SET WITH MAX SY
210 C
211 36 S(1)=0
212 E(1)=0
213 CALL SYSIZE(IANS,ISET1,ISET2,ISET3)
214 IP=ISET1
215 READ(20'IP,204),W1,X1,EMOD,XN,SY
216 EMAX=SY/(EMOD*1.E3)+.004
217 CALL CALC(NC,EMOD,XN,SY,S,E,EP,SS,EE,EMAX,NP)
218 CALL ERASE
219 CALL CHR5IZ(3)
220 CALL BINITT
221 CALL NPTS(NP)
222 CALL CHECK(E,S)
223 CALL DSPLAY(E,S)
224 CALL NPTS(3)
225 CALL LINE(-1)
226 CALL SYMBL(4)
227 CALL SIZES(.8)
228 CALL CPLOT(EE,SS)
229 CALL ANMODE
230 IF(ISET2.EQ.0.OR.IANS.EQ.1) GO TO 40
231 C
232 C * COMPUTATIONS AND DISPLAY OF CURVES 2 AND 3 FROM ALLOY LIST
233 C
234 IP=ISET2
235 37 READ(20'IP,204),WW,XX,EMOD,XN,SY
236 CALL CALC(NC,EMOD,XN,SY,S,E,EP,SS,EE,EMAX,NP)
237 CALL NPTS(NP)
238 IF(IP.EQ.ISET3) GO TO 38
239 W2=WW
240 X2=XX
241 CALL LINE(12)
242 GO TO 39
243 38 W3=WW
244 X3=XX
245 CALL LINE(5212)
246 39 CALL SYMBL(0)

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247      CALL CPLOT(E,S)
248      CALL NPTS(3)
249      CALL LINE(-1)
250      IF(IP.EQ.ISET2) CALL SYMBL(1)
251      IF(IP.NE.ISET2) CALL SYMBL(3)
252      CALL SIZES(.5)
253      CALL CPLOT(EE,SS)
254      CALL ANMODE
255      IF(IANS.EQ.2.OR.IP.EQ.ISET3) GO TO 40
256      IP=ISET3
257      GO TO 37
258  40    CALL MOVABS(250,60)
259      CALL ANMODE
260      WRITE(6,124),W1,X1,ISET1
261      CALL MOVABS(250,45)
262      CALL ANMODE
263      IF(IANS.EQ.1.OR.ISET2.EQ.0) GO TO 41
264      IF(IANS.EQ.2) WRITE(6,125),W2,X2,ISET2
265      IF(IANS.EQ.3) WRITE(6,126),W2,X2,ISET2,W3,X3,ISET3
266      CALL MOVABS(250,30)
267      CALL ANMODE
268  41    WRITE(6,127)
269      READ(5,201)
270      C
271      C-----
272      C
273      C * OPTIONS: EXAMINE ANOTHER LIST, PLOT ANOTHER CURVE, OR TERMINATE
274      C
275          CALL NEWPAG
276          CALL IOWAIT(20)
277          WRITE(6,118)
278          READ(5,201),ANS
279          IF(ANS.EQ.'NEW') GO TO 42
280          IF(ANS.EQ.'CUR') GO TO 34
281          GO TO 51
282  42    WRITE(6,128)
283          READ(5,201)
284          CALL CHRSLZ(4)
285          GO TO 1
286      C
287      C-----
288      C
289      C * ENTRY ERROR DIAGNOSTIC AND CORRECTION OPTION
290      C
291  45    WRITE(6,107)
292          WRITE(6,300)
293          READ(5,201),ANS
294          IF(ANS.EQ.'YES') GO TO (4,34,35),MX
295      C
296      C-----
297      C
298      C * TERMINATION
299      C
300  50    CALL CHRSLZ(3)
301  51    CALL NEWPAG
302          CALL IOWAIT(20)
303          CALL MOVABS(0,700)
304          CALL ANMODE
305          WRITE(6,129)
306          CALL FINITT(0,650)
307          STOP
308      C
309      C-----
310      C
311  100   FORMAT(T2,1X,'PREPARE TERMINAL FOR DATA RETRIEVAL:',//,T2,
312          1'1. ENTER: @@TTY W.132 THEN KEY RETURN',/,T2,
313          2'2. WAIT FOR RESPONSE FROM COMPUTER: -@@COMPLETE',/,T2,
314          3'3. KEY RETURN AND WAIT FOR PROGRAM TO BEGIN')

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315 101  FORMAT(T2,'TABLE BELOW LISTS RETRIEVAL OPTIONS AND ENTRIES',//,
316      1T2,'RETRIEVAL OPTION',14X,'ENTRY',/,
317      2T2,'ALL DATA FOR SELECTED MATL',4X,'ALL',/,
318      3T2,'DATA FOR SPECIFIC UTS RANGE',3X,'ULTIMATE',/,
319      4T2,'DATA FOR SPECIFIC SY RANGE',4X,'YIELD',/,
320      5T2,'DATA FOR SPECIFIC RCH RANGE',3X,'HARDNESS',/,
321      6T2,'MAKE YOUR ENTRY NOW',/)
322 102  FORMAT(T2,'YOUR ENTRY DID NOT CORRESPOND TO ANY OF THE ABOVE',/,
323      1T2,'IF YOU WISH TO CORRECT, ENTER YES',/,
324      2T2,'OTHERWISE ENTER END AND RUN WILL TERMINATE')
325 103  FORMAT(/,T2,'DATA WILL BE RETRIEVED FOR A RANGE OF VALUES OF ',
326      1'THE CHOSEN PARAMETER',/,T2,'NEXT ENTRY DEFINES LOWER AND UPPER ',
327      2'BOUNDS OF DESIRED RANGE',
328      3/,T2,'ENTRY UNITS: KSI FOR STRENGTH AND ',
329      4'ROCKWELL-C FOR HARDNESS',/,T2,'SEPARATE THE TWO VALUES BY A ',
330      5'COMMA. EXAMPLE: 150.,155.',/,T2,'ENTER BOUND VALUES NOW',/)
331 105  FORMAT(T2,'THERE ARE NO DATA IN THE DATA BANK FOR THE',/T2,,
332      1'SPECIFIED RANGE OF THE SELECTED PARAMETER',/,T2,
333      3'TO CHANGE THE RANGE LIMITS, ENTER: RANGE',/,
334      4T2,'TO LIST ALL THE DATA FOR THE MATERIAL, ENTER: ALL',/,
335      5T2,'TO CHOOSE ANOTHER OPTION, ENTER: OPTION',/,
336      6T2,'TO CHOOSE ANOTHER MATERIAL, ENTER NEW',/,
337      7T2,'OTHERWISE ENTER END AND RUN WILL TERMINATE')
338 106  FORMAT(T2,'PRINT NOW, CHANGE RETRIEVAL OPTION, OR TERMINATE',/,T2,
339      1'1. TO PRINT A LONG-FORM DATA-LIST ENTER: LONG',/,T2,
340      2'2. TO PRINT A SHORT-FORM DATA-LIST ENTER: SHORT',/,T2,
341      3'3. TO CHANGE RETRIEVAL OPTION ENTER: CHANGE',/,T2,
342      4'4. TO TERMINATE THE PROGRAM ENTER: END',/,T2,
343      5'MAKE YOUR ENTRY NOW')
344 107  FORMAT(/,T2,'** ERROR: ENTRY NOT RECOGNIZED **')
345 118  FORMAT(T2,2X,'OPTIONS: MAKE ONE OF THREE ENTRIES',/,T2,
346      1'FOR A DATA LIST OF ANOTHER MATERIAL ENTER NEW',/,T2,
347      2'FOR A GRAPH OF THE STRESS STRAIN CURVE OF A DATA SET',
348      31X,'ENTER CURVE',/,T2,'TO TERMINATE THE PROGRAM ENTER END')
349 119  FORMAT(T2,1X,/,T2,'PROCEDURE FOR GRAPHIC STRESS/STRAIN CURVE',
350      11X,'DISPLAY',/,T2,'1. ENTER @TTY W,72 AND KEY RETURN',/,T2,
351      2'2. WAIT FOR RESPONSE FROM COMPUTER: -@@COMPLETE',/,T2,
352      3'3. KEY RETURN AND WAIT FOR NEXT MESSAGE')
353 120  FORMAT(/,T2,'UP TO 3 CURVES MAY BE PLOTTED ON ONE GRAPH',/,T2,
354      1'ENTER THE NUMBER YOU WISH TO PLOT (ENTER 1, 2, OR 3)')
355 121  FORMAT(T2,'YOU ASKED FOR MORE THAN 3 CURVES',/,T2,
356      1'TO MAKE A CORRECTION ENTER YES',/,T2,
357      2'OTHERWISE KEY RETURN AND PROGRAM WILL TERMINATE')
358 122  FORMAT(/,T2,'1. ENTER DATA SET NO(S). TO BE GRAPHED & KEY RETURN',
359      1/,T2,'USE COMMAS BETWEEN SET NOS. IN ENTRY. EXAMPLE: 236,167',
360      2/,T2,'2. WAIT FOR PLOT TO APPEAR',/,T2,'3. TO CONTINUE THE',
361      31X,'PROGRAM AFTER PLOT, KEY RETURN',/,T2,
362      4'4. THE SCREEN WILL ERASE AND OPTIONS TO CONTINUE WILL APPEAR')
363 123  FORMAT(T2,'* SET NUMBER ERROR * ',/,T2,
364      1'SET NUMBERS HIGHER THAN ',I4,' NOT AVAILABLE',/,T2,
365      2'IF YOU WISH TO MAKE A CORRECTION ENTER YES',/,T2,
366      3'OTHERWISE KEY RETURN AND PROGRAM WILL TERMINATE')
367 124  FORMAT(1X,'MATL ',A2,'-',A2,2X,'SOLID CURVE: SET',I4,2X,
368      1'STRESS IN KSI * STRAIN IN IN/IN')
369 125  FORMAT(1X,'DASHED: MATL ',A2,'-',A2,' SET:',I4)
370 126  FORMAT(1X,'DASHED: MATL ',A2,'-',A2,' SET:',I4,
371      12X,'BROKEN: MATL ',A2,'-',A2,' SET:',I4)
372 127  FORMAT(1X,'PROP. LIMIT, 0.1%-YIELD, AND .2%-YIELD IDENTIFIED',
373      11X,'ON CURVES')
374 128  FORMAT(T2,'PROCEDURE FOR NEW LISTING',/,T2,
375      1'1. ENTER @TTY W,132 AND KEY RETURN',/,T2,
376      2'2. WAIT FOR RESPONSE FROM COMPUTER: -@@COMPLETE',/,T2,
377      3'3. KEY RETURN')
378 129  FORMAT(T2,'RUN IS OVER. KEY RETURN',/,T2,
379      1'WHEN PROMPT (>) APPEARS ENTER @FIN')
380 C
381 C-----
382 C

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383 200  FORMAT( )
384 201  FORMAT(A3)
385 202  FORMAT(16X,I1,13X,F6.1,8X,F4.1,13X,F7.2,4X,I4)
386 203  FORMAT(A2,19I4)
387 204  FORMAT(6X,2A2,38X,F6.2,2F7.2)
388 C
389 C-----
390 C
391 300  FORMAT(T2,'TO MAKE A CORRECTION ENTER YES',/,T2,
392      1'OTHERWISE KEY RETURN AND PROGRAM WILL TERMINATE')
393 C
394      END

```

```

1  C-----
2      SUBROUTINE TYCODE(JEND,NI,W,X)
3  C-----
4  C
5  C * SUBROUTINE DISPLAYS TABLE OF CONTENTS OF DATA FILE AND CODE DESIGNATORS
6  C * USED WITH TELETYPE OR PORTABLE TERMINALS
7  C * USER CHOOSES MATERIAL AND ALLOY FOR DATA RETRIEVAL AND DISPLAY
8  C * THEN CHOICES ARE CHECKED TO ASSURE THAT THE DATA ARE IN THE FILE
9  C
10 C-----
11 C
12     DIMENSION WA(7),XA(19),LOC(19)
13     DATA WA/'ST','TI','UR','CU','WF','AL','MG'/
14     DATA XA/'ZZ','1A','2A','3A','4A','5A','6A','7A','8A','9A',
15     1'1B','2B','3B','4B','5B','6B','7B','8B','9B'/
16     DEFINE FILE 10(50,80,E,JJ)
17 C
18 C-----
19 C
20 C * DISPLAY TABLE OF CONTENTS OF MATERIALS WITH CODE DESIGNATORS
21 C
22     WRITE(6,300)
23     JEND=0
24 C
25 C-----
26 C
27 C * READ REQUESTED MATERIAL CODE AND CHECK THAT ENTRY IS CORRECT
28 C
29     2   READ(5,400),W
30         DO 3 J=1,7
31             IF(W.NE.WA(J)) GO TO 3
32             JEND=1
33             NJ=J
34             GO TO 4
35     3   CONTINUE
36         WRITE(6,500),W
37         READ(5,401),ANS
38         IF(ANS.NE.'YES') GO TO 11
39         WRITE(6,501)
40         GO TO 2
41 C
42 C-----
43 C
44 C * DISPLAY TABLE OF ALLOYS AVAILABLE FOR REQUESTED MATERIAL
45 C * READ REQUESTED ALLOY CODE
46 C
47     4   IF(NJ.EQ.1) WRITE(6,301)
48         IF(NJ.EQ.2) WRITE(6,302)
49         IF(NJ.EQ.3) WRITE(6,303)
50         IF(NJ.EQ.4) WRITE(6,304)
51         IF(NJ.EQ.5) WRITE(6,305)
52         IF(NJ.EQ.6) WRITE(6,306)

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53      IF(NJ.EQ.7) WRITE(6,307)
54      5  WRITE(6,308)
55      READ(5,400),X
56      C
57      C-----
58      C
59      C * CHECK THAT ENTRY FOR ALLOY IS CORRECT AND THAT DATA ARE AVAILABLE
60      C
61      DO 6 L=1,19
62      IF(X.NE.XA(L)) GO TO 6
63      JEND=1
64      NL=L
65      GO TO 7
66      6  CONTINUE
67      WRITE(6,502),X
68      READ(5,401),ANS
69      IF(ANS.EQ.'YES') GO TO 5
70      GO TO 11
71      7  READ(10'NJ,402),(LOC(L),L=1,19)
72      NI=LOC(NL)
73      IF(NI.NE.0) GO TO 10
74      C
75      C-----
76      C
77      C * OPTIONS: MAKE CORRECTIONS OR TERMINATE THE RUN
78      C
79      WRITE(6,503),X
80      READ(5,401),ANS
81      IF(ANS.EQ.'ALL') GO TO 8
82      IF(ANS.EQ.'BOT') GO TO 9
83      JEND=0
84      GO TO 11
85      8  JEND=0
86      GO TO 5
87      9  WRITE(6,501)
88      GO TO 2
89      C
90      C-----
91      C
92      C * WRITE TOTAL NUMBER OF ENTRIES IN DATA BANK FOR CHOSEN MATERIAL/ALLOY
93      C * THESE TOTALS STORED IN LOCATER FILE AT N=J+30
94      C
95      10  N=NJ+30
96      READ(10'N,402),(LOC(L),L=1,19)
97      NUM=LOC(NL)
98      WRITE(6,309),W,X,NUM
99      11  RETURN
100     C
101     C-----
102     C
103     C * WRITE FORMAT STATEMENTS
104     C
105     300  FORMAT(T2,1X,'MATERIAL AND ALLOY ENTRIES MUST BE CODED',//,T2,
106           1'CODE TABLE FOR MATERIALS IN DATA BANK',//,T2,
107           22('MATERIAL CODE',4X),/,T2,2(14('-'),4X),
108           3/,T2,'STEEL ST',5X,'TUNGSTEN WF',
109           4/,T2,'TITANIUM TI',5X,'ALUMINUM AL',
110           5/,T2,'URANIUM UR',5X,'MAGNESIUM MG',
111           6/,T2,'COPPER CU',
112           7//,T2,'ENTER MATERIAL CODE NOW')
113     301  FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR STEEL',//,T2,
114           12('ALLOY NAME CODE',6X),/,T2,2(18('-'),6X),/,T2,
115           2'ARMOR UNSPEC',3X,'ZZ',7X,'RARE EARTH',5X,'1B',/,T2,'4340 UNSPEC',
116           34X,'1A',7X,'ARMCO',10X,'2B',/,T2,'MARAGE-250',5X,'2A',7X,'HI ',
117           4'NICKEL',6X,'3B',/,T2,'WC-9 ALLOY',5X,'3A',7X,'1340 UNSPEC',4X
118           5'4B',/,T2,'4140 UNSPEC',4X,'4A',7X,'LOW MANGANESE',2X,'5B',
119           6/,T2,'GILD METAL',5X,'5A',7X,'HF-1 ALLOY',5X,'6B',
120           7/,T2,'4340 ESR',7X,'6A',

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121      8/,T2,'3% NICKEL',6X,'7A',
122      9/,T2,'5% NICKEL',6X,'8A',/,T2,'AF 1410',8X,'9A'//)
123 302   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR TITANIUM',/,T2,
124      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
125      2'UNSPECIFIED' 4X,'ZZ',/,T2,
126      3'6-6-2 ALLOY',4X,'1A',/,T2,'BASE SECTN',5X,'2A',/)
127 303   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR URANIUM',/,T2,
128      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
129      2'DEPLETED',7X,'1A',/,T2,'.75-TI ALLOY',3X,'2A',/,T2,
130      3'UNALLOYED',6X,'3A',/)
131 304   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR COPPER',/,T2,
132      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
133      2'UNSPECIFIED' 4X,'ZZ',/,T2,'NO OTHER COPPER DATA AVAILABLE',/)
134 305   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR TUNGSTEN',/,T2,
135      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
136      2'UNSPECIFIED' 4X,'ZZ',/,T2,'PM UNSPEC',6X,'1A',/,T2,'SINTERED',7X,
137      3'2A',/,T2,'W-2 ALLOY',6X,'3A',/)
138 306   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR ALUMINUM',/,T2,
139      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
140      2'7075-T6',8X,'1A',/,T2,'WHISKER COMP',3X,'2A',/)
141 307   FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR MAGNESIUM',/,T2,
142      1'ALLOY NAME      CODE',/T2,18('-'),/,T2,
143      2'AZ-61A',9X,'1A',/,T2,'ONLY DATA FOR MAGNESIUM AVAILABLE',/)
144 308   FORMAT(T2,'ENTER ALLOY CODE NOW')
145 309   FORMAT(/,T2,'TOTAL NUMBER OF DATA SETS FOR MATERIAL ',
146      1A2,'-',A2,' IS',I4,/)
147 C
148 C * READ FORMAT STATEMENTS
149 C
150 400   FORMAT(A2)
151 401   FORMAT(A3)
152 402   FORMAT(2X,19I4)
153 C
154 C * DIAGNOSTIC FORMAT STATEMENTS FOR ERRONEOUS ENTRIES
155 C
156 500   FORMAT(/,T2,'THE MATERIAL CODE ENTERED ('A2,') DOES NOT APPEAR ',
157      1'IN THE CODE TABLE',/,T2,'TO CHANGE YOUR ENTRY TYPE YES',/,T2,
158      2'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
159 501   FORMAT(T2,'ENTER CORRECTED MATERIAL CODE')
160 502   FORMAT(/,T2,'THE ALLOY CODE ENTERED ('A2,') DOES NOT APPEAR ',
161      1'IN THE CODE TABLE',/,T2,'TO CHANGE YOUR ENTRY TYPE YES',/,T2,
162      2'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
163 503   FORMAT(T2,'DATA FOR ALLOY CODE ('A2,') ARE NOT YET IN THE DATA',
164      1' BANK',/,T2,'TO CHANGE ALLOY CODE ENTRY ONLY TYPE ALLOY',
165      2/,T2,'TO CHANGE BOTH MATERIAL AND ALLOY ENTRIES TYPE BOTH',/,T2,
166      3'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
167 C
168      END

```

```

1 C-----
2      SUBROUTINE CODE(LOC,JEND,NI,W,X)
3 C-----
4 C
5 C * SUBROUTINE DISPLAYS TABLE OF CONTENTS OF DATA FILE AND CODE DESIGNATORS
6 C * USED WITH CR-TUBE GRAPHICS TERMINALS
7 C * USER CHOOSES MATERIAL AND ALLOY FOR DATA RETRIEVAL AND DISPLAY
8 C * THEN CHOICES ARE CHECKED TO ASSURE THAT THE DATA ARE IN THE FILE
9 C
10 C-----
11 C
12      DIMENSION WA(7),XA(19),LOC(1)
13      DATA WA/'ST','TI','UR','CU','WF','AL','MG'/
14      DATA XA/'ZZ','1A','2A','3A','4A','5A','6A','7A','8A','9A',
15      1'1B','2B','3B','4B','5B','6B','7B','8B','9B'/
16      DEFINE FILE 10(50,80,E,JJ)

```

```

17 C
18 C-----
19 C
20 C * DISPLAY TABLE OF CONTENTS OF MATERIALS WITH CODE DESIGNATORS
21 C
22 1 WRITE(6,300)
23 JEND=0
24 C
25 C-----
26 C
27 C * READ REQUESTED MATERIAL CODE AND CHECK THAT ENTRY IS CORRECT
28 C
29 2 READ(5,400),W
30 DO 3 J=1,7
31 IF(W.NE.WA(J)) GO TO 3
32 JEND=1
33 NJ=J
34 GO TO 4
35 3 CONTINUE
36 WRITE(6,500),W
37 READ(5,401),ANS
38 IF(ANS.NE.'YES') GO TO 11
39 WRITE(6,501)
40 GO TO 2
41 C
42 C-----
43 C
44 C * DISPLAY TABLE OF ALLOYS AVAILABLE FOR REQUESTED MATERIAL
45 C * READ REQUESTED ALLOY CODE
46 C
47 4 IF(NJ.EQ.1) WRITE(6,301)
48 IF(NJ.EQ.2) WRITE(6,302)
49 IF(NJ.EQ.3) WRITE(6,303)
50 IF(NJ.EQ.4) WRITE(6,304)
51 IF(NJ.EQ.5) WRITE(6,305)
52 IF(NJ.EQ.6) WRITE(6,306)
53 IF(NJ.EQ.7) WRITE(6,307)
54 5 WRITE(6,308)
55 READ(5,400),X
56 C
57 C-----
58 C
59 C * CHECK THAT ENTRY FOR ALLOY IS CORRECT AND THAT DATA ARE AVAILABLE
60 C
61 DO 6 L=1,19
62 IF(X.NE.XA(L)) GO TO 6
63 JEND=1
64 NL=L
65 GO TO 7
66 6 CONTINUE
67 WRITE(6,502),X
68 READ(5,401),ANS
69 IF(ANS.EQ.'YES') GO TO 5
70 GO TO 11
71 7 READ(10'NJ,402),(LOC(L),L=1,19)
72 NI=LOC(NL)
73 IF(NI.NE.0) GO TO 10
74 C
75 C-----
76 C
77 C * OPTIONS: MAKE CORRECTIONS OR TERMINATE THE RUN
78 C
79 WRITE(6,503),X
80 READ(5,401),ANS
81 IF(ANS.EQ.'ALL') GO TO 8
82 IF(ANS.EQ.'BOT') GO TO 9
83 JEND=0
84 GO TO 11

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```

85 8 JEND=0
86 GO TO 5
87 9 CALL NEWPAG
88 CALL IOWAIT(20)
89 GO TO 1
90 C
91 C-----
92 C
93 C * WRITE TOTAL NUMBER OF ENTRIES IN DATA BANK FOR CHOSEN MATERIAL/ALLOY
94 C * THESE TOTALS STORED IN LOCATER FILE AT N=J+30
95 C
96 10 N=NJ+30
97 READ(10,'N,402'),(LOC(L),L=1,19)
98 NUM=LOC(NL)
99 WRITE(6,309),W,X,NUM
100 11 RETURN
101 C
102 C-----
103 C
104 C * WRITE FORMAT STATEMENTS
105 C
106 300 FORMAT(T2,1X,'MATERIAL AND ALLOY ENTRIES MUST BE CODED',//,T2,
107 1'CODE TABLE FOR MATERIALS IN DATA BANK',//,T2,
108 22('MATERIAL CODE',4X),/,T2,2(14('-'),4X),
109 3/,T2,'STEEL ST',5X,'TUNGSTEN WF',
110 4/,T2,'TITANIUM TI',5X,'ALUMINUM AL',
111 5/,T2,'URANIUM UR',5X,'MAGNESIUM MG',
112 6/,T2,'COPPER CU',
113 7//,T2,'ENTER MATERIAL CODE NOW')
114 301 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR STEEL',//,T2,
115 12('ALLOY NAME CODE',6X),/,T2,2(18('-'),6X),/,T2,
116 2'ARMOR UNSPEC',3X,'ZZ',7X,'RARE EARTH',5X,'1B',/,T2,'4340 UNSPEC',
117 34X,'1A',7X,'ARMCO',10X,'2B',/,T2,'MARAGE-250',5X,'2A',7X,'HI ',
118 4'NICKEL',6X,'3B',/,T2,'WC-9 ALLOY',5X,'3A',7X,'1340 UNSPEC',4X
119 5'4B',/,T2,'4140 UNSPEC',4X,'4A',7X,'LOW MANGANESE',2X,'5B',
120 6/,T2,'GILD METAL',5X,'5A',7X,'HF-1 ALLOY',5X,'6B',
121 7/,T2,'4340 ESR',7X,'6A',
122 8/,T2,'3% NICKEL',6X,'7A',
123 9/,T2,'5% NICKEL',6X,'8A',/,T2,'AF 1410',8X,'9A'//)
124 302 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR TITANIUM',//,T2,
125 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
126 2'UNSPECIFIED',4X,'ZZ',/,T2,
127 3'6-6-2 ALLOY',4X,'1A',/,T2,'BASE SECTN',5X,'2A',/)
128 303 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR URANIUM',//,T2,
129 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
130 2'DEPLETED',7X,'1A',/,T2,'.75-TI ALLOY',3X,'2A',/,T2,
131 3'UNALLOYED',6X,'3A',/)
132 304 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR COPPER',//,T2,
133 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
134 2'UNSPECIFIED',4X,'ZZ',//,T2,'NO OTHER COPPER DATA AVAILABLE',/)
135 305 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR TUNGSTEN',//,T2,
136 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
137 2'UNSPECIFIED',4X,'ZZ',/,T2,'PM UNSPEC',6X,'1A',/,T2,'SINTERED',7X,
138 3'2A',/,T2,'W-2 ALLOY',6X,'3A',/)
139 306 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR ALUMINUM',//,T2,
140 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
141 2'7075-T6',8X,'1A',/,T2,'WHISKER COMP',3X,'2A',/)
142 307 FORMAT(/,T2,'ALLOYS AND ALLOY CODES FOR MAGNESIUM',//,T2,
143 1'ALLOY NAME CODE',/T2,18('-'),/,T2,
144 2'AZ-61A',9X,'1A',/,T2,'ONLY DATA FOR MAGNESIUM AVAILABLE',/)
145 308 FORMAT(T2,'ENTER ALLOY CODE NOW')
146 309 FORMAT(/,T2,'TOTAL NUMBER OF DATA SETS FOR MATERIAL ',
147 1A2,'-',A2,' IS',I4,/)
148 C
149 C * READ FORMAT STATEMENTS
150 C
151 400 FORMAT(A2)
152 401 FORMAT(A3)

```

```

153 402  FORMAT(2X,19I4)
154 C
155 C * DIAGNOSTIC FORMAT STATEMENTS FOR ERRONEOUS ENTRIES
156 C
157 500  FORMAT(/,T2,'THE MATERIAL CODE ENTERED ('.A2,') DOES NOT APPEAR ',
158      1'IN THE CODE TABLE',/,T2,'TO CHANGE YOUR ENTRY TYPE YES',/,T2,
159      2'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
160 501  FORMAT(T2,'ENTER CORRECTED MATERIAL CODE')
161 502  FORMAT(/,T2,'THE ALLOY CODE ENTERED ('.A2,') DOES NOT APPEAR ',
162      1'IN THE CODE TABLE',/,T2,'TO CHANGE YOUR ENTRY TYPE YES',/,T2,
163      2'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
164 503  FORMAT(T2,'DATA FOR ALLOY CODE ('.A2,') ARE NOT YET IN THE DATA',
165      1' BANK',/,T2,'TO CHANGE ALLOY CODE ENTRY ONLY TYPE ALLOY',
166      2/,T2,'TO CHANGE BOTH MATERIAL AND ALLOY ENTRIES TYPE BOTH',/,T2,
167      3'OTHERWISE TYPE END AND PROGRAM WILL TERMINATE',/)
168 C
169      END

```

```

1 C-----
2      SUBROUTINE RANGE(W,X,NI,IDENT,JEND)
3 C-----
4 C
5 C * SUBROUTINE FINDS MIN-MAX OF SELECTED PARAMETER FOR ALL STORED DATA
6 C * FILE 20 IS DATABANK FILE
7 C
8      DEFINE FILE 20(9999,80,E,II)
9      I HOLD=NI
10     1  NUM=0
11        GO TO (2,10,20),IDENT
12 C
13 C-----
14 C
15 C * ULTIMATE STRENGTH RANGE
16 C
17     2  READ(20'NI,200),SULT,NEXT
18        NI=NEXT
19        BIG=SULT
20        SMA=SULT
21        NUM=NUM+1
22        IF(NEXT.EQ.0) GO TO 30
23     3  READ(20'NI,200),SULT,NEXT
24        NI=NEXT
25        IF(SULT.GT.BIG) BIG=SULT
26        IF(SULT.LT.SMA) SMA=SULT
27        NUM=NUM+1
28        IF(NEXT.EQ.0) GO TO 30
29        GO TO 3
30 C
31 C * YIELD STRENGTH RANGE
32 C
33     10 READ(20'NI,201),SY,NEXT
34        NI=NEXT
35        BIG=SY
36        SMA=SY
37        NUM=NUM+1
38        IF(NEXT.EQ.0) GO TO 30
39     11 READ(20'NI,201),SY,NEXT
40        NI=NEXT
41        IF(SY.GT.BIG) BIG=SY
42        IF(SY.LT.SMA) SMA=SY
43        NUM=NUM+1
44        IF(NEXT.EQ.0) GO TO 30
45        GO TO 11
46 C
47 C * ROCKWELL-C HARDNESS RANGE * CHECK IF HARDNESS DATA ARE AVAILABLE

```

```

48 C
49 20 READ(20'NI,202),RCH,NEXT
50 NI=NEXT
51 IF(RCH.LE.0.AND.NEXT.GT.0) GO TO 20
52 IF(RCH.LE.0.AND.NEXT.EQ.0) GO TO 22
53 BIG=RCH
54 SMA=RCH
55 NUM=NUM+1
56 IF(NEXT.EQ.0) GO TO 30
57 21 READ(20'NI,202),RCH,NEXT
58 NI=NEXT
59 IF(RCH.LE.0.AND.NEXT.GT.0) GO TO 21
60 IF(RCH.LE.0.AND.NEXT.EQ.0) GO TO 30
61 IF(RCH.GT.BIG) BIG=RCH
62 IF(RCH.LT.SMA) SMA=RCH
63 NUM=NUM+1
64 IF(NEXT.EQ.0) GO TO 30
65 GO TO 21
66 C
67 C-----
68 C
69 C * CHANGE OF OPTIONS IF NO HARDNESS DATA AVAILABLE
70 C
71 22 WRITE(6,100),W,X
72 IDENT=0
73 READ(5,203),ANS
74 IF(ANS.EQ.'ALL') GO TO 40
75 IF(ANS.EQ.'ULT') IDENT=1
76 IF(ANS.EQ.'YIE') IDENT=2
77 IF(IDENT.GT.0) GO TO 23
78 JEND=0
79 GO TO 40
80 23 NI=IHOLD
81 GO TO 1
82 C
83 C-----
84 C
85 C * WRITE RANGE VALUES
86 C
87 30 IF(IDENT.EQ.1) WRITE(6,101),W,X,SMA,BIG,NUM
88 IF(IDENT.EQ.2) WRITE(6,102),W,X,SMA,BIG,NUM
89 IF(IDENT.EQ.3) WRITE(6,103),W,X,SMA,BIG,NUM
90 40 RETURN
91 C
92 C-----
93 C
94 100 FORMAT(T2,'** THERE ARE NO HARDNESS DATA AVAILABLE FOR MATERIAL ',
95 1A2,'-',A2,' **',/,T2,'ENTER ANOTHER OPTION FROM THE LIST ABOVE',
96 2/,T2,'OR ENTER END TO TERMINATE RUN',/,T2,'MAKE YOUR ENTRY NOW')
97 101 FORMAT(T2,'RANGE OF ULTIMATE STRENGTH FOR MATL ',A2,'-',A2,
98 1' IS ',F6.1,' TO ',F6.1,' KSI',/,T2,
99 2'THE TOTAL NUMBER OF ENTRIES WITH NON-ZERO DATA IS',I4)
100 102 FORMAT(T2,'RANGE OF YIELD STRENGTH FOR MATL ',A2,'-',A2,
101 1' IS ',F7.2,' TO ',F7.2,' KSI',/,T2,
102 2'THE TOTAL NUMBER OF ENTRIES WITH NON-ZERO DATA IS',I4)
103 103 FORMAT(T2,'RANGE OF ROCKWELL HARDNESS FOR MATL ',A2,'-',A2,
104 1' IS ',F4.1,' TO ',F4.1,'/',T2,
105 2'THE TOTAL NUMBER OF ENTRIES WITH NON-ZERO DATA IS',I4)
106 200 FORMAT(30X,F6.1,36X,I4)
107 201 FORMAT(61X,F7.2,4X,I4)
108 202 FORMAT(44X,F4.1,24X,I4)
109 203 FORMAT(A3)
110 C
111 END

```

```

1 C-----
2       SUBROUTINE COUNT(IDENT,NI,XMIN,XMAX)
3 C-----
4 C
5 C * COUNTS NUMBER OF DATABANK ENTRIES IN SELECTED MIN-MAX RANGE
6 C * FILE 20 IS DATABANK FILE
7 C
8       DEFINE FILE 20(9999,80,E,II)
9       NUM=0
10      IHOLD=NI
11      GO TO (1,2,3),IDENT
12 C
13 C-----
14 C
15 C * ULTIMATE STRENGTH
16 C
17 1     READ(20'NI,200),SULT,NEXT
18       IF(SULT.GE.XMIN.AND.SULT.LE.XMAX) NUM=NUM+1
19       IF(NEXT.EQ.0) GO TO 4
20       NI=NEXT
21       GO TO 1
22 C
23 C * 0.2%-OFFSET YIELD STRESS
24 C
25 2     READ(20'NI,201),SY,NEXT
26       IF(SY.GE.XMIN.AND.SY.LE.XMAX) NUM=NUM+1
27       IF(NEXT.EQ.0) GO TO 4
28       NI=NEXT
29       GO TO 2
30 C
31 C * ROCKWELL-C HARDNESS
32 C
33 3     READ(20'NI,202),RCH,NEXT
34       IF(RCH.GE.XMIN.AND.RCH.LE.XMAX) NUM=NUM+1
35       IF(NEXT.EQ.0) GO TO 4
36       NI=NEXT
37       GO TO 3
38 C
39 C-----
40 C
41 C * WRITE NUMBER OF ENTRIES
42 C
43 4     WRITE(6,100),NUM
44       NI=IHOLD
45       RETURN
46 C
47 C-----
48 C
49 100    FORMAT(T2,'THE NUMBER OF ENTRIES WITHIN THE CHOSEN RANGE IS',I4)
50 200    FORMAT(30X,F6.1,36X,I4)
51 201    FORMAT(61X,F7.2,4X,I4)
52 202    FORMAT(44X,F4.1,24X,I4)
53 C
54      END

```

```

1 C-----
2       SUBROUTINE LONG(W,X,NI,IDENT,XMIN,XMAX)
3 C-----
4 C
5 C * THIS SUBROUTINE LISTS LONG-FORM DATA ON CRT OF GRAPHICS TERMINAL
6 C * THERE ARE FOUR OPTIONS FLAGGED BY VALUE OF IDENT
7 C * IDENT=0: ALL DATA FOR SELECTED MATL/ALLOY
8 C * IDENT=1: ONLY DATA FOR A USER-SELECTED RANGE OF ULTIMATE STRENGTH
9 C * IDENT=2: ONLY DATA FOR A USER-SELECTED RANGE OF YIELD STRENGTH
10 C * IDENT=3: ONLY DATA FOR A USER-SELECTED RANGE OF ROCKWELL-C HARDNESS

```



```

11 C
12 C-----
13 C
14 C * FILE 20 IS DATABANK
15 C
16 C      DEFINE FILE 20(9999,80,E,11)
17 C
18 C-----
19 C
20 1  CALL NEWPAG
21    CALL IOWAIT(20)
22    WRITE(6,100),W,X
23    IF(IDENT.EQ.0) GO TO 2
24    IF(IDENT.EQ.1) WRITE(6,101),XMIN,XMAX
25    IF(IDENT.EQ.2) WRITE(6,102),XMIN,XMAX
26    IF(IDENT.EQ.3) WRITE(6,103),XMIN,XMAX
27 2  K=0
28    KI=0
29    WRITE(6,104)
30 3  READ(20,NI,200),SN,BOOK,NPAGE,NTYPE,NDATE,KTEMP,KEDOT,SULT,
31    1ELONG,RA,RCH,EMOD,XN,SY,SEE,NEXT,ISET
32    NI=NEXT
33    IF(NTYPE.NE.1) GO TO 4
34    IF(IDENT.EQ.0) GO TO 5
35    IF(IDENT.EQ.1.AND.SULT.LE.XMAX.AND.SULT.GE.XMIN) GO TO 5
36    IF(IDENT.EQ.2.AND.SY.LE.XMAX.AND.SY.GE.XMIN) GO TO 5
37    IF(IDENT.EQ.3.AND.RCH.LE.XMAX.AND.RCH.GE.XMIN) GO TO 5
38 4  IF(NEXT.EQ.0) GO TO 9
39    GO TO 3
40 5  XP=1./XN
41    SPL=SY*5.E-3**XP
42    SY1=SY*5.E-1**XP
43    WRITE(6,105),ISET,KTEMP,KEDOT,EMOD,XN,SPL,SY1,SY,SULT,SEE,
44    1ELONG,RA,RCH,NDATE,BOOK,NPAGE,SN
45    K=K+1
46    KI=KI+1
47 6  IF(NEXT.EQ.0) GO TO 9
48    IF(K.EQ.56) GO TO 8
49    IF(MOD(KI,5).EQ.0) GO TO 7
50    GO TO 3
51 7  WRITE(6,106)
52    K=K+1
53    GO TO 3
54 8  WRITE(6,107)
55    READ(5,201),ANS
56    GO TO 1
57 9  WRITE(6,108),W,X
58    READ(5,201),ANS
59    RETURN
60 C
61 C-----
62 C
63 100  FORMAT(T2,'LONG-FORM LIST OF DATA FOR MATL CODE: ',A2,'-',A2)
64 101  FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',
65    1'ULTIMATE STRENGTH WAS IN THE RANGE: ',F6.1,' TO ',F6.1,' KSI')
66 102  FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',
67    1'YIELD STRENGTH WAS IN THE RANGE: ',F7.2,' TO ',F7.2,' KSI')
68 103  FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',
69    1'ROCKWELL-C HARDNESS WAS IN THE RANGE: ',F4.1,' TO ',F4.1,)
70 104  FORMAT(T2,'** MAKE NOTE OF ANY SET NUMBERS TO BE GRAPHED **',//,
71    1T2,' SET TEMP LOG MODULUS',4X,'R-O',5X,'P-LIM',2X,
72    2'.1%-YLD',2X,'.2%-YLD',4X,'UTS',4X,'SEE',2X,'ELNG',3X,'R-A',2X,
73    3'ROCK TEST',4X,'NTBK-',4X,'SPEC',/,T2,' NO DEG-C EDOT '
74    4'M-PSI',4X,'EXPNT',2X,3(3X,'KSI',3X),1X,2(1X,'KSI',3X),'PCT',
75    53X,'PCT',2X,'C-HD',3X,'DATE',4X,'PAGE',6X,'NO',/)
76 105  FORMAT(T2,I4,2X,I5,3X,I2,3X,F6.2,2X,4(F7.2,2X),F6.1,2X,
77    14(F4.1,2X),I6,2X,A4,'-',I2,2X,A6)
78 106  FORMAT(1H )

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79 107  FORMAT(/,T2,'**THERE ARE MORE DATA FOR THIS ALLOY IN THE FILE',
80      11X,' * MAKE NOTES NOW AND TO CONTINUE KEY RETURN')
81 108  FORMAT(/,T2,'**LISTING IS COMPLETE FOR MATL ',A2,'-',A2,
82      11X,' * MAKE NOTES NOW AND TO CONTINUE KEY RETURN')
83 C
84 C-----
85 C
86 200  FORMAT(A6,4X,A4,I2,I1,I6,I5,I2,F6.1,3F4.1,F6.2,2F7.2,F4.1,2I4)
87 201  FORMAT(A3)
88 C
89      END

```

```

1  C-----
2      SUBROUTINE LPRT(W,X,NI,IDENT,XMIN,XMAX)
3  C-----
4  C
5  C * THIS SUBROUTINE LISTS LONG-FORM DATA ON TELETYPE TERMINAL
6  C * THERE ARE FOUR OPTIONS FLAGGED BY VALUE OF IDENT
7  C * IDENT=0: ALL DATA FOR SELECTED MATL/ALLOY
8  C * IDENT=1: ONLY DATA FOR A USER-SELECTED RANGE OF ULTIMATE STRENGTH
9  C * IDENT=2: ONLY DATA FOR A USER-SELECTED RANGE OF YIELD STRENGTH
10 C * IDENT=3: ONLY DATA FOR A USER-SELECTED RANGE OF ROCKWELL-C HARDNESS
11 C
12 C-----
13 C
14 C * FILE 20 IS DATABANK
15 C
16      DEFINE FILE 20(9999,80,E,II)
17 C
18 C-----
19 C
20      WRITE(6,100),W,X
21      IF(IDENT.EQ.0) GO TO 2
22      IF(IDENT.EQ.1) WRITE(6,101),XMIN,XMAX
23      IF(IDENT.EQ.2) WRITE(6,102),XMIN,XMAX
24      IF(IDENT.EQ.3) WRITE(6,103),XMIN,XMAX
25  2    KI=0
26      WRITE(6,104)
27  3    READ(20'NI,200),SN,BOOK,NPAGE,NTYPE,NDATE,KTEMP,KEDOT,SULT,
28      1ELONG,RA,RCH,EMOD,XN,SY,SEE,NEXT,ISET
29      NI=NEXT
30      IF(NTYPE.NE.1) GO TO 4
31      IF(IDENT.EQ.0) GO TO 5
32      IF(IDENT.EQ.1.AND.SULT.LE.XMAX.AND.SULT.GE.XMIN) GO TO 5
33      IF(IDENT.EQ.2.AND.SY.LE.XMAX.AND.SY.GE.XMIN) GO TO 5
34      IF(IDENT.EQ.3.AND.RCH.LE.XMAX.AND.RCH.GE.XMIN) GO TO 5
35  4    IF(NEXT.EQ.0) GO TO 7
36      GO TO 3
37  5    XP=1./XN
38      SPL=SY*5.E-3**XP
39      SY1=SY*5.E-1**XP
40      WRITE(6,105),ISET,KTEMP,KEDOT,EMOD,XN,SPL,SY1,SY,SULT,SEE,
41      1ELONG,RA,RCH,NDATE,BOOK,NPAGE,SN
42      KI=KI+1
43  6    IF(NEXT.EQ.0) GO TO 7
44      IF(MOD(KI,5).EQ.0) WRITE(6,106)
45      GO TO 3
46  7    WRITE(6,107),W,X
47      READ(5,201),ANS
48      RETURN
49 C
50 C-----
51 C
52 100  FORMAT(//,T2,'LONG-FORM LIST OF DATA FOR MATL CODE: ',A2,'-',A2)
53 101  FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',

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```

54      1'ULTIMATE STRENGTH WAS IN THE RANGE: ',F6.1,' TO ',F6.1,' KSI')
55 102   FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',
56      1'YIELD STRENGTH WAS IN THE RANGE: ',F7.2,' TO ',F7.2,' KSI')
57 103   FORMAT(T2,'LIST INCLUDES ONLY DATA FOR TESTS WHERE THE ',
58      1'ROCKWELL-C HARDNESS WAS IN THE RANGE: ',F4.1,' TO ',F4.1,)
59 104   FORMAT(/,T2,112(' '),/,
60      1T2,' SET TEMP LOG MODULUS',4X,'R-O',5X,'P-LIM',2X,
61      2'.1%-YLD',2X,'.2%-YLD',4X,'UTS',4X,'SEE',2X,'ELNG',3X,'R-A',2X,
62      3'ROCK TEST',4X,'NTBK-',4X,'SPEC',/,T2,' NO DEG-C EDOT '
63      4'M-PSI',4X,'EXPNT',2X,3(3X,'KSI',3X),1X,2(1X,'KSI',3X),'PCT',
64      53X,'PCT',2X,'C-HD',3X,'DATE',4X,'PAGE',6X,'NO',/)
65 105   FORMAT(T2,I4,2X,I5,3X,I2,3X,F6.2,2X,4(F7.2,2X),F6.1,2X,
66      14(F4.1,2X),I6,2X,A4,'-',I2,2X,A6)
67 106   FORMAT(1H )
68 107   FORMAT(/,T2,'**LISTING IS COMPLETE FOR MATL ',A2,'-',A2,
69      11X,' * TO CONTINUE THE PROGRAM KEY RETURN')
70 C
71 C-----
72 C
73 200   FORMAT(A6,4X,A4,I2,I1,I6,I5,I2,F6.1,3F4.1,F6.2,2F7.2,F4.1,2I4)
74 201   FORMAT(A3)
75 C
76      END

```

```

1 C-----
2      SUBROUTINE SHORT(W,X,NI,IDENT,XMIN,XMAX)
3 C-----
4 C
5 C * THIS SUBROUTINE LISTS SHORT-FORM DATA ON CRT OF GRAPHICS TERMINAL
6 C * THERE ARE FOUR OPTIONS FLAGGED BY VALUE OF IDENT
7 C * IDENT=0: ALL DATA FOR SELECTED MATL/ALLOY
8 C * IDENT=1: ONLY DATA FOR A USER-SELECTED RANGE OF ULTIMATE STRENGTH
9 C * IDENT=2: ONLY DATA FOR A USER-SELECTED RANGE OF YIELD STRENGTH
10 C * IDENT=3: ONLY DATA FOR A USER-SELECTED RANGE OF ROCKWELL-C HARDNESS
11 C
12 C-----
13 C
14      DIMENSION RAC(2),XPC(2),UTC(2),ELC(2),HDC(2),EMC(2),SYC(2),
15      1ISC(2),KTP(2)
16 C
17 C-----
18 C
19 C * FILE 20 IS DATABANK
20 C
21      DEFINE FILE 20(9999,80,E,II)
22 C
23 C-----
24 C
25 1      CALL NEWPAG
26      CALL IOWAIT(20)
27      WRITE(6,100),W,X
28      IF(IDENT.EQ.0) GO TO 2
29      IF(IDENT.EQ.1) WRITE(6,101),XMIN,XMAX
30      IF(IDENT.EQ.2) WRITE(6,102),XMIN,XMAX
31      IF(IDENT.EQ.3) WRITE(6,103),XMIN,XMAX
32 2      WRITE(6,104)
33      K=0
34      KI=0
35 3      IX=0
36 4      IX=IX+1
37 5      READ(20'NI,200),NTYPE,KTP(IX),UTC(IX),ELC(IX),RAC(IX),
38      1HDC(IX),EMC(IX),XPC(IX),SYC(IX),NEXT,ISC(IX)
39      NI=NEXT
40      IF(NTYPE.NE.1) GO TO 6
41      IF(IDENT.EQ.0.AND.IX.EQ.2) GO TO 8

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```

42      IF(IDENT.EQ.0.AND.NEXT.EQ.0) GO TO 8
43      IF(IDENT.EQ.0) GO TO 4
44      IF(IDENT.EQ.1.AND.UTC(IX).LE.XMAX.AND.UTC(IX).GE.XMIN) GO TO 7
45      IF(IDENT.EQ.2.AND.SYC(IX).LE.XMAX.AND.SYC(IX).GE.XMIN) GO TO 7
46      IF(IDENT.EQ.3.AND.HDC(IX).LE.XMAX.AND.HDC(IX).GE.XMIN) GO TO 7
47  6    IF(IX.EQ.1.AND.NEXT.NE.0) GO TO 3
48      IF(IX.EQ.2.AND.NEXT.NE.0) GO TO 5
49      IF(IX.EQ.1) GO TO 11
50      IX=1
51      GO TO 8
52  7    IF(IX.EQ.2) GO TO 8
53      IF(IX.EQ.1.AND.NEXT.EQ.0) GO TO 8
54      GO TO 4
55  8    IF(IX.EQ.2) WRITE(6,105), (ISC(IX),KTP(IX),EMC(IX),
56      1SYC(IX),UTC(IX),XPC(IX),ELC(IX),RAC(IX),HDC(IX),IX=1,2)
57      IF(IX.EQ.1) WRITE(6,106),ISC(IX),KTP(IX),EMC(IX),
58      1SYC(IX),UTC(IX),XPC(IX),ELC(IX),RAC(IX),HDC(IX)
59      K=K+1
60      KI=KI+1
61      IF(NEXT.EQ.0) GO TO 11
62      IF(K.EQ.56) GO TO 10
63      IF(MOD(KI,5).EQ.0) GO TO 9
64      GO TO 3
65  9    WRITE(6,107)
66      K=K+1
67      GO TO 3
68  10   WRITE(6,108)
69      READ(5,201),ANS
70      GO TO 1
71  11   WRITE(6,109),W,X
72      READ(5,201),ANS
73      RETURN
74  C
75  C-----
76  C
77  100  FORMAT(T2,1X,'LISTING OF SHORT-FORM TEST DATA FOR MATL/ALLOY ',
78      1A2,'-',A2)
79  101  FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',
80      1'ULTIMATE STRENGTH WAS IN THE RANGE: ',F6.1,' TO ',F6.1,' KSI')
81  102  FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',
82      1'YIELD STRENGTH WAS IN THE RANGE: ',F7.2,' TO ',F7.2,' KSI')
83  103  FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',
84      1'ROCKWELL-C HARDNESS WAS IN THE RANGE: ',F4.1,' TO ',F4.1)
85  104  FORMAT(T2,'* MAKE NOTE OF ANY SET NUMBERS TO BE GRAPHED',/,
86      1T2,2(1X,'SET TEMP EMOD .2%-SY',5X,'UTS',5X,'R-O ELNG',
87      2' R-A R-C',3X),/,T2,2(1X,'NO DEG-C M-PSI',2X,2(3X,'KSI',
88      33X),1X,'EXPNT',3X,2('PCT',3X),'HRD',3X),/)
89  105  FORMAT(T2,2(I4,1X,I5,2X,F6.2,2X,F7.2,2X,F6.1,2X,F7.2,2X,
90      13(F4.1,2X),1X))
91  106  FORMAT(T2,I4,1X,I5,2X,F6.2,2X,F7.2,2X,F6.1,2X,F7.2,2X,
92      13(F4.1,2X))
93  107  FORMAT(1H )
94  108  FORMAT(/,T2,'**THERE ARE MORE DATA FOR THIS ALLOY IN THE FILE',
95      11X,' * MAKE NOTES NOW AND TO CONTINUE KEY RETURN')
96  109  FORMAT(/,T2,'**LISTING IS COMPLETE FOR MATL ',A2,'-',A2,
97      11X,' * MAKE NOTES NOW AND TO CONTINUE KEY RETURN')
98  C
99  C-----
100  C
101  200  FORMAT(16X,I1,6X,I5,2X,F6.1,3F4.1,F6.2,2F7.2,4X,
102      12I4)
103  201  FORMAT(A3)
104  C
105      END

```



```

1 C-----
2 SUBROUTINE SPRT(W,X,NI,IDENT,XMIN,XMAX)
3 C-----
4 C
5 C * THIS SUBROUTINE LISTS SHORT-FORM DATA ON TELETYPE TERMINAL
6 C * THERE ARE FOUR OPTIONS FLAGGED BY VALUE OF IDENT
7 C * IDENT=0: ALL DATA FOR SELECTED MATL/ALLOY
8 C * IDENT=1: ONLY DATA FOR A USER-SELECTED RANGE OF ULTIMATE STRENGTH
9 C * IDENT=2: ONLY DATA FOR A USER-SELECTED RANGE OF YIELD STRENGTH
10 C * IDENT=3: ONLY DATA FOR A USER-SELECTED RANGE OF ROCKWELL-C HARDNESS
11 C
12 C-----
13 C
14 DIMENSION RAC(2),XPC(2),UTC(2),ELC(2),HDC(2),EMC(2),SYC(2),
15 1ISC(2),KTP(2)
16 C
17 C-----
18 C
19 C * FILE 20 IS DATABANK
20 C
21 DEFINE FILE 20(9999,80,E,II)
22 C
23 C-----
24 C
25 1 WRITE(6,100),W,X
26 IF(IDENT.EQ.0) GO TO 2
27 IF(IDENT.EQ.1) WRITE(6,101),XMIN,XMAX
28 IF(IDENT.EQ.2) WRITE(6,102),XMIN,XMAX
29 IF(IDENT.EQ.3) WRITE(6,103),XMIN,XMAX
30 2 WRITE(6,104)
31 KI=0
32 3 IX=0
33 4 IX=IX+1
34 5 READ(20'NI,200),NTYPE,KTP(IX),UTC(IX),ELC(IX),
35 1RAC(IX),HDC(IX),EMC(IX),XPC(IX),SYC(IX),NEXT,ISC(IX)
36 NI=NEXT
37 IF(NTYPE.NE.1) GO TO 6
38 IF(IDENT.EQ.0.AND.IX.EQ.2) GO TO 8
39 IF(IDENT.EQ.0.AND.NEXT.EQ.0) GO TO 8
40 IF(IDENT.EQ.0) GO TO 4
41 IF(IDENT.EQ.1.AND.UTC(IX).LE.XMAX.AND.UTC(IX).GE.XMIN) GO TO 7
42 IF(IDENT.EQ.2.AND.SYC(IX).LE.XMAX.AND.SYC(IX).GE.XMIN) GO TO 7
43 IF(IDENT.EQ.3.AND.HDC(IX).LE.XMAX.AND.HDC(IX).GE.XMIN) GO TO 7
44 6 IF(IX.EQ.1.AND.NEXT.NE.0) GO TO 3
45 IF(IX.EQ.2.AND.NEXT.NE.0) GO TO 5
46 IF(IX.EQ.1) GO TO 9
47 IX=1
48 GO TO 8
49 7 IF(IX.EQ.2) GO TO 8
50 IF(IX.EQ.1.AND.NEXT.EQ.0) GO TO 8
51 GO TO 4
52 8 IF(IX.EQ.2) WRITE(6,105),(ISC(IX),KTP(IX),EMC(IX),
53 1SYC(IX),UTC(IX),XPC(IX),ELC(IX),RAC(IX),HDC(IX),IX=1,2)
54 IF(IX.EQ.1) WRITE(6,106),ISC(IX),KTP(IX),EMC(IX),
55 1SYC(IX),UTC(IX),XPC(IX),ELC(IX),RAC(IX),HDC(IX)
56 KI=KI+1
57 IF(NEXT.EQ.0) GO TO 9
58 IF(MOD(KI,5).EQ.0) WRITE(6,107)
59 GO TO 3
60 9 WRITE(6,108),W,X
61 READ(5,201),ANS
62 RETURN
63 C
64 C-----
65 C
66 100 FORMAT(T2,1X,'LISTING OF SHORT-FORM TEST DATA FOR MATL/ALLOY ',
67 1A2,'-',A2)
68 101 FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',

```

```

69      1'ULTIMATE STRENGTH WAS IN THE RANGE: ',F6.1,' TO ',F6.1,' KSI')
70 102  FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',
71      1'YIELD STRENGTH WAS IN THE RANGE: ',F7.2,' TO ',F7.2,' KSI')
72 103  FORMAT(T2,'LIST INCLUDES DATA FOR TESTS WHERE THE ',
73      1'ROCKWELL-C HARDNESS WAS IN THE RANGE: ',F4.1,' TO ',F4.1)
74 104  FORMAT(/,T2,62('-'),3X,62('-'),/,
75      1T2,2(1X,'SET TEMP EMOD .2%-SY',5X,'UTS',5X,'R-O ELNG',
76      2' R-A R-C',3X),/,T2,2(1X,'NO DEG-C M-PSI',2X,2(3X,'KSI',
77      33X),1X,'EXPNT',3X,2('PCT',3X),'HRD',3X),/)
78 105  FORMAT(T2,2(I4,1X,I5,2X,F6.2,2X,F7.2,2X,F6.1,2X,F7.2,2X,
79      13(F4.1,2X),1X))
80 106  FORMAT(T2,I4,1X,I5,2X,F6.2,2X,F7.2,2X,F6.1,2X,F7.2,2X,
81      13(F4.1,2X))
82 107  FORMAT(1H)
83 108  FORMAT(/,T2,'**LISTING IS COMPLETE FOR MATL ',A2,'-',A2,
84      11X' * TO CONTINUE THE PROGRAM KEY RETURN')
85 C
86 C-----
87 C
88 200  FORMAT(16X,I1,6X,I5,2X,F6.1,3F4.1,F6.2,2F7.2,4X,
89      12I4)
90 201  FORMAT(A3)
91 C
92      END

```

```

1 C-----
2      SUBROUTINE PORPRT(W,X,NI,IDENT,XMIN,XMAX)
3 C-----
4 C
5 C * THIS SUBROUTINE LISTS EXPANDED SHORT-FORM DATA ON PORTABLE TERMINAL
6 C * THERE ARE FOUR OPTIONS FLAGGED BY VALUE OF IDENT
7 C * IDENT=0: ALL DATA FOR SELECTED MATL/ALLOY
8 C * IDENT=1: ONLY DATA FOR A USER-SELECTED RANGE OF ULTIMATE STRENGTH
9 C * IDENT=2: ONLY DATA FOR A USER-SELECTED RANGE OF YIELD STRENGTH
10 C * IDENT=3: ONLY DATA FOR A USER-SELECTED RANGE OF ROCKWELL-C HARDNESS
11 C
12 C-----
13 C
14 C * FILE 20 IS DATABANK
15 C
16      DEFINE FILE 20(9999,80,E,II)
17 C
18 C-----
19 C
20      WRITE(6,100),W,X
21      IF(IDENT.EQ.0) GO TO 2
22      IF(IDENT.EQ.1) WRITE(6,101),XMIN,XMAX
23      IF(IDENT.EQ.2) WRITE(6,102),XMIN,XMAX
24      IF(IDENT.EQ.3) WRITE(6,103),XMIN,XMAX
25 2      KI=0
26      WRITE(6,104)
27 3      READ(20'NI,200),NTYPE,KTEMP,KEDOT,SULT,
28      1ELONG,RA,RCH,EMOD,XN,SY,NEXT,ISET
29      NI=NEXT
30      IF(NTYPE.NE.1) GO TO 4
31      IF(IDENT.EQ.0) GO TO 5
32      IF(IDENT.EQ.1.AND.SULT.LE.XMAX.AND.SULT.GE.XMIN) GO TO 5
33      IF(IDENT.EQ.2.AND.SY.LE.XMAX.AND.SY.GE.XMIN) GO TO 5
34      IF(IDENT.EQ.3.AND.RCH.LE.XMAX.AND.RCH.GE.XMIN) GO TO 5
35 4      IF(NEXT.EQ.0) GO TO 6
36      GO TO 3
37 5      XP=1./XN
38      SPL=SY*.5-E-3**XP
39      SY1=SY*.5**XP
40      WRITE(6,105),ISET,KTEMP,KEDOT,EMOD,XN,SPL,SY1,SY,SULT,ELONG,

```

```

41      1RA,RCH
42      KI=KI+1
43      IF(NEXT.EQ.0) GO TO 6
44      IF(MOD(KI,5).EQ.0) WRITE(6,106)
45      GO TO 3
46  6    WRITE(6,107),W,X
47      READ(5,201),ANS
48      RETURN
49  C
50  C-----
51  C
52  100   FORMAT(//,T2,75('-'),//,T2,'EXPANDED SHORT-FORM',
53        1' LIST OF DATA FOR MATL CODE: ',A2,'-',A2,/,T2,
54        2'(FOR A FULL LONG-FORM LIST USE TELETYPE OR CRT TERMINAL)',/)
55  101   FORMAT(T2,'LIST INCLUDES ONLY TESTS WITH ',
56        1'ULTIMATE FROM ',F6.1,' TO ',F6.1,' KSI',/)
57  102   FORMAT(T2,'LIST INCLUDES ONLY TESTS WITH ',
58        1'YIELD FROM ',F7.2,' TO ',F7.2,' KSI',/)
59  103   FORMAT(T2,'LIST INCLUDES ONLY TESTS WITH ',
60        1'R-C HARDNESS FROM ',F4.1,' TO ',F4.1,/)
61  104   FORMAT(T3,
62        1'SET TEMP LOG EMOD',5X,'R-O',4X,'P-LIM .1%-YLD .2%-YLD',
63        23X,'UTS ELNG R-A ROCK',/,T4,'NO DG-C EDOT M-PSI EXPNT',
64        33(4X,'KSI',1X),3X,'KSI',1X,2(2X,'PCT'),1X,'C-HD',/)
65  105   FORMAT(T2,I4,I5,2X,I2,2X,F6.2,4(1X,F7.2),1X,F6.1,
66        13(1X,F4.1))
67  106   FORMAT(1H )
68  107   FORMAT(//,T2,75('-'),//,
69        1T2,'**LISTING IS COMPLETE FOR MATL ',A2,'-',A2,
70        2/,T2,'TO CONTINUE THE PROGRAM KEY RETURN')
71  C
72  C-----
73  C
74  200   FORMAT(16X,I1,6X,I5,I2,F6.1,3F4.1,F6.2,2F7.2,4X,2I4)
75  201   FORMAT(A3)
76  C
77      END

```

```

1  C-----
2      SUBROUTINE SYSIZE(IANS,ISET1,ISET2,ISET3)
3  C-----
4  C
5  C * FINDS SET WITH MAXIMUM SY AND ASSIGNS ISET1 TO THAT SET
6  C * ISET1 IS KEY SET TO ESTABLISH GRAPH SIZE FOR S-E CURVE PLOT
7  C * PROCEDURE ASSURES THAT ALL POINTS OF ALL CURVES WILL BE ON GRAPH
8  C
9  C-----
10 C
11 C * FILE 20 IS DATABANK FILE
12 C
13     DEFINE FILE 20(9999,80,E,II)
14 C
15 C-----
16 C
17     IF(IANS.GT.1.AND.ISET2.EQ.0) IANS=1
18     IF(IANS.EQ.1) RETURN
19     IF(IANS.EQ.3.AND.ISET3.EQ.0) IANS=2
20     IF(IANS.EQ.2) GO TO 2
21     READ(20'ISET1,200),SY1
22     READ(20'ISET2,200),SY2
23     READ(20'ISET3,200),SY3
24     IF(SY1.GE.SY2.AND.SY1.GE.SY3) RETURN
25     IF(SY2.GE.SY3) GO TO 1
26     IHOLD1=ISET3
27     IHOLD2=ISET1

```

```

28      ISET1=IHOLD1
29      ISET3=IHOLD2
30      RETURN
31  1    IHOLD1=ISET2
32      IHOLD2=ISET1
33      ISET1=IHOLD1
34      ISET2=IHOLD2
35      RETURN
36  2    READ(20'ISET1,200),SY1
37      READ(20'ISET2,200),SY2
38      IF(SY1.GE.SY2) RETURN
39      GO TO 1
40  C
41  C-----
42  C
43  200  FORMAT(61X,F7.4)
44  C
45      END

```

```

1  C-----
2      SUBROUTINE CALC(NC,EMOD,XN,SY,S,E,EP,SS,EE,EMAX,NP)
3  C-----
4  C
5  C * SUBROUTINE CALCULATES STRESS-STRAIN DATA FROM WHICH CURVE IS PLOTTED
6  C * PLASTIC STRAIN TERM OF R-O EQUATION USED: EP=.002*(S/SY)**XN
7  C * EQUATION SOLVED FOR S FOR GIVEN INCREMENTED VALUES OF EP
8  C * LAST POINT CALCULATED IS VALUE OF S FOR EP=0.006 IN/IN
9  C * PROPORTL LIMIT & 0.1% YIELD STRESS-STRAIN & 0.2% YIELD STRAIN CALCULATED
10 C
11 C-----
12 C
13      DIMENSION S(1),E(1),EP(1),SS(1),EE(1)
14      EMOD=EMOD*1.E3
15      XP=1./XN
16      S(2)=SY*5.E-3**XP
17      E(2)=S(2)/EMOD
18      SS(1)=S(2)
19      EE(1)=E(2)
20      SS(2)=SY*5.E-1**XP
21      EE(2)=1.E-3+SS(2)/EMOD
22      SS(3)=SY
23      EE(3)=2.E-3+SY/EMOD
24      DO 1 I=3,NC
25          S(I)=SY*(EP(I)/2.E-3)**XP
26          E(I)=EP(I)+S(I)/EMOD
27          IF(E(I).LT.EMAX) GO TO 1
28          GO TO 2
29  1    CONTINUE
30      NP=NC
31      RETURN
32  2    NP=I
33      RETURN
34  C
35      END

```



```
1 @ASG,A R*LOCATER.  
2 @USE 10,R*LOCATER  
3 @ASG,A R*DATABANK.  
4 @USE 20,R*DATABANK  
5 @XQT R*RETRIEVE.TYP
```

```
1 @ASG,A R*LOCATER.  
2 @USE 10,R*LOCATER  
3 @ASG,A R*DATABANK.  
4 @USE 20,R*DATABANK  
5 @XQT R*RETRIEVE.CRT
```

```
1 @PREP R*RETRIEVE.  
2 @MAP,I LISS,R*RETRIEVE.TYP  
3 IN R*RETRIEVE.PMAIN  
4 LIB R*RETRIEVE.  
5 END
```

```
1 @PREP R*RETRIEVE.  
2 @MAP,I CIS,R*RETRIEVE.CRT  
3 IN R*RETRIEVE.TMAIN  
4 IN R*RETRIEVE.BUFFPK  
5 LIB R*RETRIEVE.  
6 LIB DAO*TEX.  
7 END
```

LISTING OF R*FIXBANK

The FIXBANK file consists of two main program elements and four control elements as follows:

Element	Function
MAIN1	Print tabular listing of the DATABANK and LOCATER file contents
MAIN2	Add data to DATABANK file, update LOCATER file, and print updated contents of both data files
START1	Control routine to assign DATABANK and LOCATER files and to execute MAIN1
START2	Control routine same as START1 except executes MAIN2
MAP1	Control routine used when MAIN1 is revised to PREP the file, to form the absolute (name: PRINT), to PACK the file, and to print a list of file elements
MAP2	Same function as MAP1, but for MAIN2 (absolute name: UPDATE).

Each FIXBANK program is a batch-process execution from a UNIVAC 9300 hard-copy terminal. The input to MAIN2 consists of the two decks of output cards punched by the EVALRO program (see Reference 1).

Listings of the two main programs are given on pages 56-59. The four control elements are listed, in the order given above, on page 60.

ACKNOWLEDGMENTS

I wish to acknowledge my colleagues Colin Freese, Anna Hansen, and James McLaughlin for the assistance and advice they gave me in software development and for the education they gave me on the use and the limitations of the digital computer.

```

1 C -----
2 C * FILE R*FIXBANK IS FOR MANAGEMENT OF R*LOCATER AND R*DATABANK FILES
3 C * THIS IS ELEMENT MAIN1 (ABSOLUTE: PRINT)
4 C -----
5 C
6 C * MAIN1 PRINTS CONTENTS OF R*LOCATER AND R*DATABANK ON 9300 TERMINAL
7 C
8 C -----
9 C
10 C      DIMENSION LOC(19)
11 C
12 C -----
13 C
14 C * FILE 10 IS THE LOCATER FILE
15 C * FILE 20 IS THE DATABANK FILE
16 C
17 C      DEFINE FILE 10(50,80,E,JJ)
18 C      DEFINE FILE 20(9999,80,E,II)
19 C
20 C
21 C -----
22 C
23 C * IDENTIFY SET NUMBER OF LAST DATA BANK ENTRY (LAST SET=NI)
24 C * LAST SET NUMBER IS UPPER LIMIT OF DATA BANK PRINT-OUT DO-LOOP
25 C
26 C * SECTION 1 OF LOCATER FILE PRINTED
27 C
28 C      NI=0
29 C      PRINT 203
30 C      DO 20 J=1,7
31 C      READ(10'J,102), (LOC(L),L=1,19)
32 C      PRINT 204,J,W,(LOC(L),L=1,19)
33 C      DO 10 L=1,19
34 C      IF(LOC(L).LE.NI) GO TO 10
35 C      NI=LOC(L)
36 C      10 CONTINUE
37 C      20 CONTINUE
38 C
39 C -----
40 C
41 C * CONTENT OF SECTION 2 OF LOCATER NOW PRINTED
42 C
43 C      PRINT 205
44 C      DO 30 J=1,7
45 C      N=J+30
46 C      READ(10'N,101),W,(LOC(L),L=1,19)
47 C      PRINT 204,N,W,(LOC(L),L=1,19)
48 C      30 CONTINUE
49 C
50 C -----
51 C
52 C * PRINT-OUT OF DATA BANK
53 C
54 C      NPAGE=i
55 C      PRINT 200,NPAGE
56 C      DO 50 I=1,NI
57 C      READ(20'I,100),SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
58 C      1XN,SY,SEE,NEXT,ISET
59 C      PRINT 201,SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
60 C      1XN,SY,SEE,NEXT,ISET
61 C      IF(MOD(I,5).NE.0) GO TO 50
62 C      IF(MOD(I,45).EQ.0) GO TO 40
63 C      PRINT 202
64 C      GO TO 50
65 C      40 IF(N.EQ.NI) GO TO 50
66 C      NPAGE=NPAGE+1
67 C      PRINT 200,NPAGE
68 C      50 CONTINUE

```

```

69 C
70 C-----
71 C
72 100 FORMAT(A6,2A2,A4,I2,I1,I6,I5,I2,F6.1,3F4.1,F6.2,2F7.2,F4.1,2I4)
73 101 FORMAT(A2,19I4)
74 102 FORMAT(2X,19I4)
75 103 FORMAT(72X,2I4)
76 C
77 C-----
78 C
79 200 FORMAT(1H1,T5,'PAGE NUMBER',I3,/,
80 1 T5,2X,'SN',4X,'WM',2X,'XM',2X,'BOOK',2X,'PG',2X,'T',
81 23X,'DATE',4X,'TEMP',2X,'ED',4X,'ULT',3X,'ELNG',3X,'R-A',3X,'R-C',
82 34X,'EMOD',4X,'EXPNT',5X,'SY',5X,'SEE',2X,'NEXT',2X,'ISET',/)
83 201 FORMAT(T5,A6,2X,2(A2,2X),A4,2X,I2,2X,I1,2X,I6,2X,I5,2X,I2,2X,
84 1F6.1,2X,3(F4.1,2X),F6.2,2X,2(F7.2,2X),F4.1,2(2X,I4))
85 202 FORMAT(1H )
86 203 FORMAT(1H1,T10,'CONTENT OF LOCATER FILE',//,T10,
87 1'NO',2X,'MT',3X,'ZZ',2X,'1A',2X,'2A',2X,'3A',2X,'4A',2X,'5A',2X,
88 2'6A',2X,'7A',2X,'8A',2X,'9A',2X,'1B',2X,'2B',2X,'3B',2X,'4B',
89 32X,'5B',2X,'6B',2X,'7B',2X,'8B',2X,'9B',/)
90 204 FORMAT(T10,I2,2X,A2,1X,19I4)
91 205 FORMAT(/,T10,83('-'),/,T10,'** NUMBER OF ENTRIES FOR EACH MATERIAL
92 1/ALLOY **',/,T10,83('-'),/)
93 C
94 END

```

```

1 C-----
2 C * FILE R*FIXBANK IS FOR MANAGEMENT OF R*LOCATER AND R*DATABANK FILES
3 C * THIS IS ELEMENT MAIN2 (ABSOLUTE: UPDATE)
4 C-----
5 C
6 C * MAIN2 UPDATES CONTENTS OF R*LOCATER AND R*DATABANK FILES
7 C * IT ALSO PRINTS OUT THE CONTENTS OF EACH OF THE UPDATED FILES
8 C
9 C * PROGRAM INPUT: CARDS PUNCHED BY ANALYSIS PROGRAM R*EVALRO
10 C * TWO DECKS OF CARDS: ONE FOR DATABANK AND ONE FOR LOCATER FILE
11 C
12 C-----
13 C
14 DIMENSION LOC(19),NLOC(19),NHOLD(10,19),NUM(10,19)
15 C
16 C-----
17 C
18 C * FILE 10 IS THE LOCATER FILE
19 C * FILE 20 IS THE DATABANK FILE
20 C
21 DEFINE FILE 10(50,80,E,JJ)
22 DEFINE FILE 20(9999,80,E,II)
23 C
24 C-----
25 C
26 C * UPDATE OF DATABANK
27 C * EACH LINE OF DATA BANK IS A CARD IMAGE OF A DATA CARD OF EVALRO
28 C * LINE NUMBER IS SAME AS DATA SET NUMBER (I=ISET) AND IS IN COLS 77-80
29 C * SET NUMBER OF LAST PREVIOUS ENTRY FOR SAME MATL/ALLOY IN COLS 73-76
30 C * LAST PREVIOUS ENTRY SET NO IS CALLED NEXT (SET*NEXT)
31 C
32 C-----
33 C
34 C * READ EVALRO DATA CARDS AND WRITE CARD IMAGES IN DATA BANK
35 C * LAST DATA CARD IS A DUMMY WITH SET NO. OF ZERO
36 C
37 1 READ(5,100),SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
38 1XN,SY,SEE,NEXT,ISET

```



```

39      IF(ISET.EQ.0) GO TO 2
40      I=ISET
41      WRITE(20'I,100),SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
42      1XN,SY,SEE,NEXT,ISET
43      GO TO 2
44  C
45  C-----
46  C
47  C * READ ENTIRE CONTENT OF DATA BANK AND PRINT
48  C
49      2      NI=I
50              NPAGE=1
51              PRINT 200,NPAGE
52              DO 4 I=1,NI
53                  READ(20'I,100),SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
54                  1XN,SY,SEE,NEXT,ISET
55                  PRINT 201,SN,W,X,BK,NPG,NTY,NDA,KT,KE,SU,ELG,RA,RCH,EMOD,
56                  1XN,SY,SEE,NEXT,ISET
57                  IF(MOD(I,5).NE.0) GO TO 4
58                  IF(MOD(I,45).EQ.0) GO TO 3
59                  PRINT 202
60                  GO TO 4
61      3      NPAGE=NPAGE+1
62              PRINT 200,NPAGE
63      4      CONTINUE
64  C
65  C-----
66  C
67  C * UPDATE OF LOCATER FILE
68  C
69  C * LOCATER FILE HAS TWO SECTIONS: 1. KEYSET LOCATION AND 2. NUMBER OF ENTRIES
70  C * SECTION 1 (LINES 1-30): SET NO. OF LAST DATABANK ENTRY FOR EACH MATL/ALLOY
71  C * EACH MATERIAL ON A SEPARATE LINE (LINE NO.=J)
72  C * COLS 1 & 2 MATERIAL CODE FOLLOWED BY 19 FOUR-COLUMN GROUPS
73  C * EACH GROUP (L=GROUP NO.) REFERS TO SPECIFIC ALLOY * ENTRY IS LAST SET NO.
74  C * COLS 79-80 BLANK AND RESERVED FOR LATER USE AS CONTINUATION LOCATIONS
75  C * SECTION 2 (LINES 31-50): NUMBER OF DATA ENTRIES FOR EACH MATERIAL/ALLOY
76  C * MATL/ALLOY OF LINE J POSITION L SAME AS FOR LINE J+30 POSITION L
77  C
78  C-----
79  C
80  C * UPDATE OF SECTION 1 OF LOCATER
81  C * READ EVALRO LOCATER CARDS * READ AND HOLD LOCATER VALUES CURRENTLY IN FILE
82  C
83              PRINT 203
84              J=0
85      10      READ(5,101,END=20),W,(LOC(L),L=1,19)
86              J=J+1
87              READ(10'J,102),(NHOLD(J,L),L=1,19)
88  C
89  C-----
90  C
91  C ENTER NEW LOCATER VALUES IN FILE AND PRINT FILE CONTENT
92  C
93              WRITE(10'J,101),W,(LOC(L),L=1,19)
94              PRINT 204,J,W,(LOC(L),L=1,19)
95              GO TO 10
96  C
97  C-----
98  C
99  C * UPDATE OF SECTION 2 OF LOCATER
100 C * NUMBER OF ENTRIES OF EACH MATL/ALLOY JUST ENTERED IN DATABANK COUNTED
101 C * THIS NUMBER ADDED TO CURRENT TOTALS IN SECTION 2 OF LOCATER
102 C * THEN NEW NUMBER OF ENTRIES WRITTEN IN SECTION 2 OF LOCATER TO UPDATE IT
103 C
104      20      NJ=J
105              DO 24 J=1,NJ
106              N=J+30

```

```

107      READ(10'J,101),W,(LOC(L),L=1,19)
108      DO 22 L=1,19
109      NUM(J,L)=0
110      NI=LOC(L)
111      IF(NI.EQ.0) GO TO 22
112 21    READ(20'NI,103),NEXT,ISET
113      IF(ISET.EQ.NHOLD(J,L)) GO TO 22
114      NUM(J,L)=NUM(J,L)+1
115      IF(NEXT.EQ.0.OR.NEXT.EQ.NHOLD(J,L)) GO TO 22
116      NI=NEXT
117      GO TO 21
118 22    CONTINUE
119      READ(10'N,102),(NLOC(L),L=1,19)
120      DO 23 L=1,19
121      NLOC(L)=NLOC(L)+NUM(J,L)
122 23    CONTINUE
123      WRITE(10'N,101),W,(NLOC(L),L=1,19)
124 24    CONTINUE
125  C
126 -----
127  C
128  C * CONTENT OF SECTION 2 OF LOCATER NOW PRINTED
129  C
130      PRINT 205
131      DO 30 J=1,NJ
132      N=J+30
133      READ(10'N,101),W,(NLOC(L),L=1,19)
134      PRINT 204,N,W,(NLOC(L),L=1,19)
135      PUNCH 101,W,(NLOC(L),L=1,19)
136 30    CONTINUE
137  C
138 -----
139  C
140 100   FORMAT(A6,2A2,A4,I2,I1,I6,I5,I2,F6.1,3F4.1,F6.2,2F7.2,F4.1,2I4)
141 101   FORMAT(A2,19I4)
142 102   FORMAT(2X,19I4)
143 103   FORMAT(72X,2I4)
144  C
145 -----
146  C
147 200   FORMAT(1H1,T5,'PAGE NUMBER',I3,/,
148      1      T5,2X,'SN',4X,'WM',2X,'XM',2X,'BOOK',2X,'PG',2X,'T',
149      23X,'DATE',4X,'TEMP',2X,'ED',4X,'ULT',3X,'ELNG',3X,'R-A',3X,'R-C',
150      34X,'EMOD',4X,'EXPNT',5X,'SY',5X,'SEE',2X,'NEXT',2X,'ISET',/)
151 201   FORMAT(T5,A6,2X,2(A2,2X),A4,2X,I2,2X,I1,2X,I6,2X,I5,2X,I2,2X,
152      1F6.1,2X,3(F4.1,2X),F6.2,2X,2(F7.2,2X),F4.1,2(2X,I4))
153 202   FORMAT(1H )
154 203   FORMAT(1H1,T10,'CONTENT OF LOCATER FILE',//,T10,
155      1'NO',2X,'MT',3X,'ZZ',2X,'1A',2X,'2A',2X,'3A',2X,'4A',2X,'5A',2X,
156      2'6A',2X,'7A',2X,'8A',2X,'9A',2X,'1B',2X,'2B',2X,'3B',2X,'4B',
157      32X,'5B',2X,'6B',2X,'7B',2X,'8B',2X,'9B',/)
158 204   FORMAT(T10,I2,2X,A2,1X,19I4)
159 205   FORMAT(/,T10,83('-'),/,T10,'** NUMBER OF ENTRIES FOR EACH MATERIAL
160      1/ALLOY **',/,T10,83('-'),/)
161  C
162      END

```

```
1 @ASG,A R*DATABANK
2 @USE 20,R*DATABANK
3 @ASG,A R*LOCATER
4 @USE 10,R*LOCATER
5 @XQT R*FIXBANK.PRINT
```

```
1 @ASG,A R*DATABANK
2 @USE 20,R*DATABANK
3 @ASG,A R*LOCATER
4 @USE 10,R*LOCATER
5 @XQT R*FIXBANK.UPDATE
```

```
1 @PREP R*FIXBANK.
2 @MAP,I CISSY,R*FIXBANK.PRINT
3 IN R*FIXBANK.MAIN1
4 END
5 @PACK R*FIXBANK.
6 @PRT,TL R*FIXBANK.
```

```
1 @PREP R*FIXBANK.
2 @MAP,I CIS,R*FIXBANK.UPDATE
3 IN R*FIXBANK.MAIN2
4 END
5 @PACK R*FIXBANK.
6 @PRT,TL R*FIXBANK.
```

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